USER SERVICE REQUIREMENTS - LARGE SYSTEMS

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1984   c.2

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INPUT Planning Services for Management

USER SERVICE REQUIREMENTS-
LARGE SYSTEMS

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USER SERVICE REQUIREMENTS - LARGE SYSTEMS

CONTENTS

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USER SERVICE REQUIREMENTS - LARGE SYSTEMS

EXHIBITS

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I INTRODUCTION

I   INTRODUCTION

- This report is produced by INPUT as part of the 1984 Customer Service Program for the United States, for clients of that program.

- The emphasis of this report is to identify user requirements and levels of satisfaction with service on their large-scale systems. Users were encouraged to respond according to their needs rather than according to pre-established contractual agreements.

- The importance of satisfying user requirements for service becomes even more crucial as the introduction of such concepts as third-party maintenance and single-source service create an increasingly competitive services market-place.

- As competition has increased, so has the demand for profitability among field service vendors. Vendors are constantly looking for new ways to increase service revenues while keeping maintenance prices down. Involving field engineers in the sales function or encouraging user involvement in the maintenance process are just two of the examples discussed in the report. For these reasons, INPUT has scheduled the user requirements series of reports as the first deliverable of the program.

- This report addresses only large-system users. Where possible, each vendor is treated separately, so that each may review data from its own users. This also allows rough comparisons to be made. Vendors are cautioned, however,

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that each user group (e.g., Amdahl users) has a unique profile that is usually different enough from other user groups' to make comparisons of vendor performances invalid.

A. DEMOGRAPHICS

- A total of 345 user interviews were conducted by telephone between January and March 1984. Exhibit I-1 shows the breakdown by product and vendor. Exhibit I-2 lists the user sample by industry sector serviced, and Exhibit I-3 identifies the person interviewed by position title.

- While geographic distribution was heavily weighted toward urban areas, clients should note that regions in the continental U.S. are evenly represented.

B. METHODOLOGY

- The basis of the interview was the questionnaire shown in Appendix B. As the data was collected, it was entered on dBASE II's relational data base management system and analyzed using ABSTAT, a statistical analysis software package. Additional information about the software, hardware, and user requirements data base is included in Appendix A.

- The list of users to be interviewed was selected from a variety of public and nonpublic sources:

    - Client-provided user lists.

    - Publicly available subscription sources.

- 2 -

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EXHIBIT I-1

INTERVIEW SAMPLE BY VENDOR

Amdahl		Honeywell	
470	19	66 DPS	20
5860	1	DPS 7	3
Total	20	DPS 8	21
		Total	44
Burroughs		IBM	
B59XX	11	303X	14
B6XXX	10	308X	14
B7XXX	10	43XX	23
Total	31	Total	51
CDC		NAS	
170/7XX	23	AS 5000	1
170/8XX	7	AS 6XXX	10
205/XXX	1	AS 7XXX	7
OMEGA	5	AS 8XXX	2
Total	36	AS 9XXX	16
		Total	36
Cray		UNIVAC	
I	9	90/XX	31
Total	9	1100/XX	21
		Total	52
Data General			
MV 4000	3		
MV 6000	2		
MV 8000	19	TOTAL	
MV 10000	1	INTERVIEWS	345
Total	25		
DEC			
DEC-10	7		
DEC-20	12		
VAXII/750	5		
VAXII/780	17		
Total	41		

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EXHIBIT I-2

- 4 -

LARGE-SYSTEM USER SAMPLE BY INDUSTRY SECTOR

SECTOR	USER INTERVIEWS
Process Manufacturing	35
Discrete Manufacturing	61
Transportation	12
Utilities	20
Banking and Finance	10
Insurance	16
Medical	14
Education	45
Retail	9
Wholesale	18
Federal Government	7
State and Local Government	37
Services	53
Other	8
Total	345

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EXHIBIT I-3

- 5 -

TITLE OF PERSON INTERVIEWED

Vice President/Assistant Vice President	23
Director/Assistant Director	47
Manager/Assistant Manager	223
Supervisor	25
Systems Administrator	22
Systems Analyst	5
Total	345

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- INPUT files.

- INPUT data base listings.

- Approximately 35% of the respondents in the 1984 large-systems survey also participated in the 1983 survey.

- All respondents were assured that their responses would remain completely confidential. The data provided here cannot be linked to individual respondents.

- 6 -

II EXECUTIVE SUMMARY

II EXECUTIVE SUMMARY

A. INTRODUCTION

- This Executive Summary is designed to help the busy reader quickly review the research findings of this report without having to read each section, while ensuring that the key points are not missed. Each main point is summarized as an exhibit, and an accompanying script is given on the facing page.

- The large-system marketplace is showing the first signs of a clear dichotomy developing among the vendors. One one hand are IBM and the plug-compatibles (Amdahl and NAS) who observe each other carefully and react swiftly to each other's service offerings (from both a performance and a price standpoint). On the other hand are the other vendors who are not so closely tied together or to IBM.

- Across the board, the IBM/compatibles group has a better service image (not always born out by the details of service performance) and tends to have similar user requirements.

- One of the issues that this report addresses is the setting and satisfying of user service expectations: each vendor's user base has a different set of user requirements, largely influenced by the vendor itself (by its sales force). User satisfaction is directly related to ensuring that users' expectations are not set above the service level that the vendor can provide.

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B.   OVERALL USER RATINGS OF LARGE-SYSTEM VENDOR SERVICE

- The average user rating of vendor service in the large-system market fell in 1984 compared to 1983, but a big difference emerged between:

    - IBM and the plug-compatibles NAS and Amdahl, all of whom had increases in their user ratings and all of whom met or exceeded an 8.5 out of 10 rating.

    - All other vendors, only one of whom had an increase in user rating (Burroughs), and most of whom were over a point lower on the user rating scale than the IBM group.

- It is evident from a comparative analysis of the stated user requirements in 1983 and 1984, that where a need is allowed to go unmet, it decreases in intensity (user requirements are lowered). However, as soon as the vendor's performance begins to be raised, the users raise their requirements. This can be very frustrating to the vendor since it is very difficult to judge how far the goal should be raised.

- Exhibit II-1 is disturbing in that vendors having a user rating at or above 8.5 represent:

    - Seventy-two percent of 1983 sales of large systems.

    - IBM-compatible equipment.

- Exhibit II-1 suggests that IBM/plug-compatible standards of service are the yardstick of the majority of the large-system user base, against which the other vendors will be measured - and found wanting. However, the true yardstick is the user requirement, which varies from vendor to vendor. In Chapter III of this report, individual vendor performances are compared against their users' needs.

- 8 -

EXHIBIT II-1

OVERALL USER RATINGS OF LARGE-SYSTEM VENDOR SERVICE

VENDOR	1984 PERFORMANCE	1984 MEAN (1-10)
IBM and Compatibles		
Amdahl	2.4%	8.7
IBM	2.4%	8.5
NAS	1.2%	8.5
Non-IBM		
Cray	(9.3%)	7.8
DEC	(1.3%)	7.7
CDC	(1.3%)	7.4
Univac	(2.6%)	7.4
Burroughs	7.4%	7.3
Honeywell	(2.7%)	7.1
Data General	(8.1%)	6.8

```
  10      5       0       5      10
DECREASE%            INCREASE %
          1984 Over 1983
```

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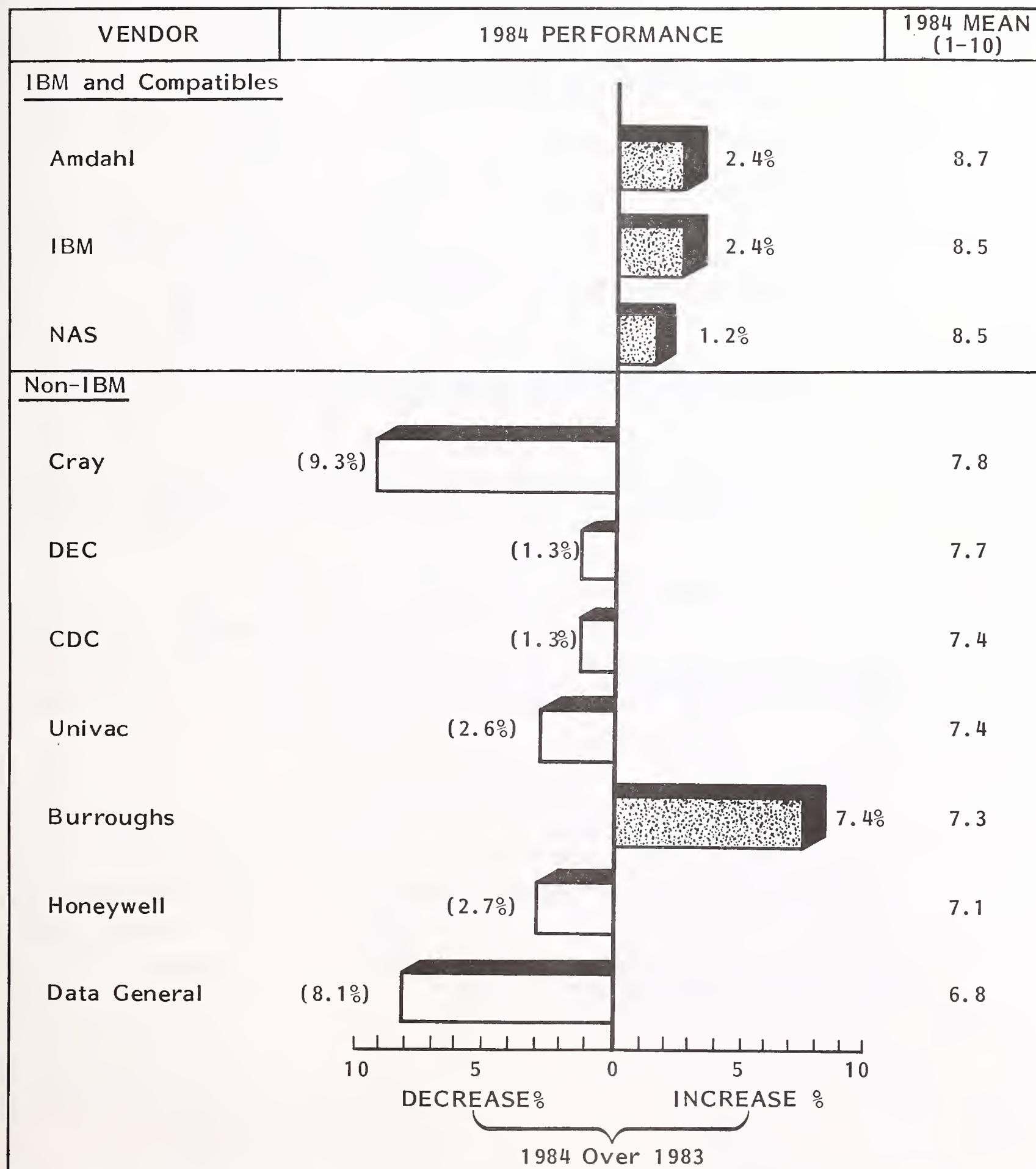
C. LARGE-SYSTEM USER SERVICE REQUIREMENTS

- Most large-system service organizations are meeting their contractual obligations vis a vis the user base (and in some cases exceeding them). However, there is a large body of users whose requirements go beyond the standard contract options available to them.

- By user standards, the three basic, fundamental post-sale services need improvement:

    - Hardware maintenance, where 48.8% of users are dissatisfied, the same level of dissatisfaction as in 1983.

    - Software maintenance, where 43.7% of users are dissatisfied (an improvement over the 1983 performance when 56% were dissatisfied).

    - Documentation, where 48.6% of users are dissatisfied, which represents a worsening picture compared to 1983, when only 45% were dissatisfied.

- It is mandatory that each vendor know the service requirements of its particular user base. Too much attention is being focused on what the competition does or does not do. Each vendor is attempting to align services with "the industry." Meanwhile the users' needs go unanswered.

- Documentation and training are frequently beyond the control of customer services management (most often they're a part of marketing). But both play a crucial role in post-sale user satisfaction and both should address operational maintenance issues and procedures more clearly. It is only by paying attention to the fundamentals (however mundane) that the ratings in Exhibit II-2 are going to be improved.

- 10 -

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EXHIBIT II-2

LARGE-SYSTEM USER SERVICE REQUIREMENTS

RESPONDENTS

290	Planning	75.9%
283	Consulting	71.0%
325	48.6% Documentation	
288	Training	63.5%
341	48.8% Hardware Maintenance	
284	43.7% Software Maintenance	
213	Sales of Supplies	79.8%
285	Add-On Sales	72.6%
230	Site Audits	74.8%
261	Relocation/Deinstallation	87.4%

100%   80   60   40   20   0   20   40   60   80   100%

Dissatisfaction (Percent)   Satisfaction (Percent)

% = Areas of Concern

- II -

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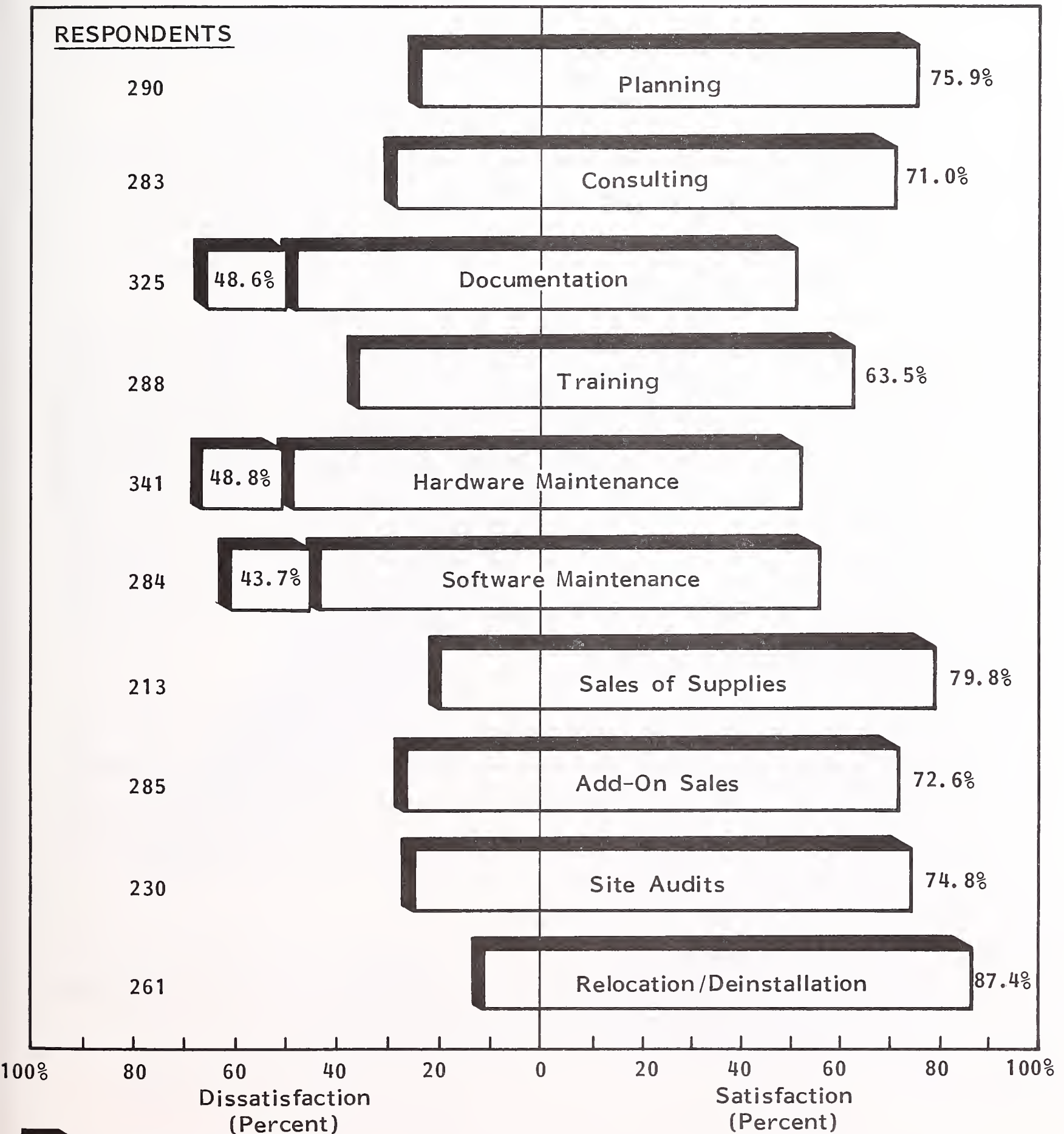
D. TARGETING LARGE-SYSTEM USER SATISFACTION

- The aims of the customer services division are to:

    - Accurately target user needs.

    - Enhance product sale potential by creating an image of high reliability and vendor responsiveness.

    - Maximize revenues (taking advantage of service opportunities, wherever they exist) and expand the revenue base.

    - Make a profit, consistently.

- A useful way of ensuring that service productivity and efficiency are kept high, while maintaining a high level of user satisfaction, is to be able to accurately target user satisfaction with all of the post-sale service components. INPUT suggests that vendors never exceed user requirements by more than 10% at the high end of user needs, or 3% at the low end of user needs (UPPER LIMIT line on Exhibit II-3). It is equally important that vendor service should not be more than 3% below user requirements for high-end user needs or 10% below those for low-end user needs (LOWER LIMIT line on Exhibit II-3).

- On Exhibit II-3, low-level user requirements are to the left of the chart (e.g., "G," sale of supplies) and high-level needs to the right (e.g., "E," hardware maintenance). The greater the importance, the closer the rating should be to the SATISFACTION LINE (conversely, the lower the importance, the farther away the rating can be).

- Each vendor should review its own user ratings in Chapter III to see how accurately user satisfaction has been targeted for each of the ten post-sale services monitored - and then take appropriate action.

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EXHIBIT II-3

TARGETING LARGE-SYSTEM USER SATISFACTION
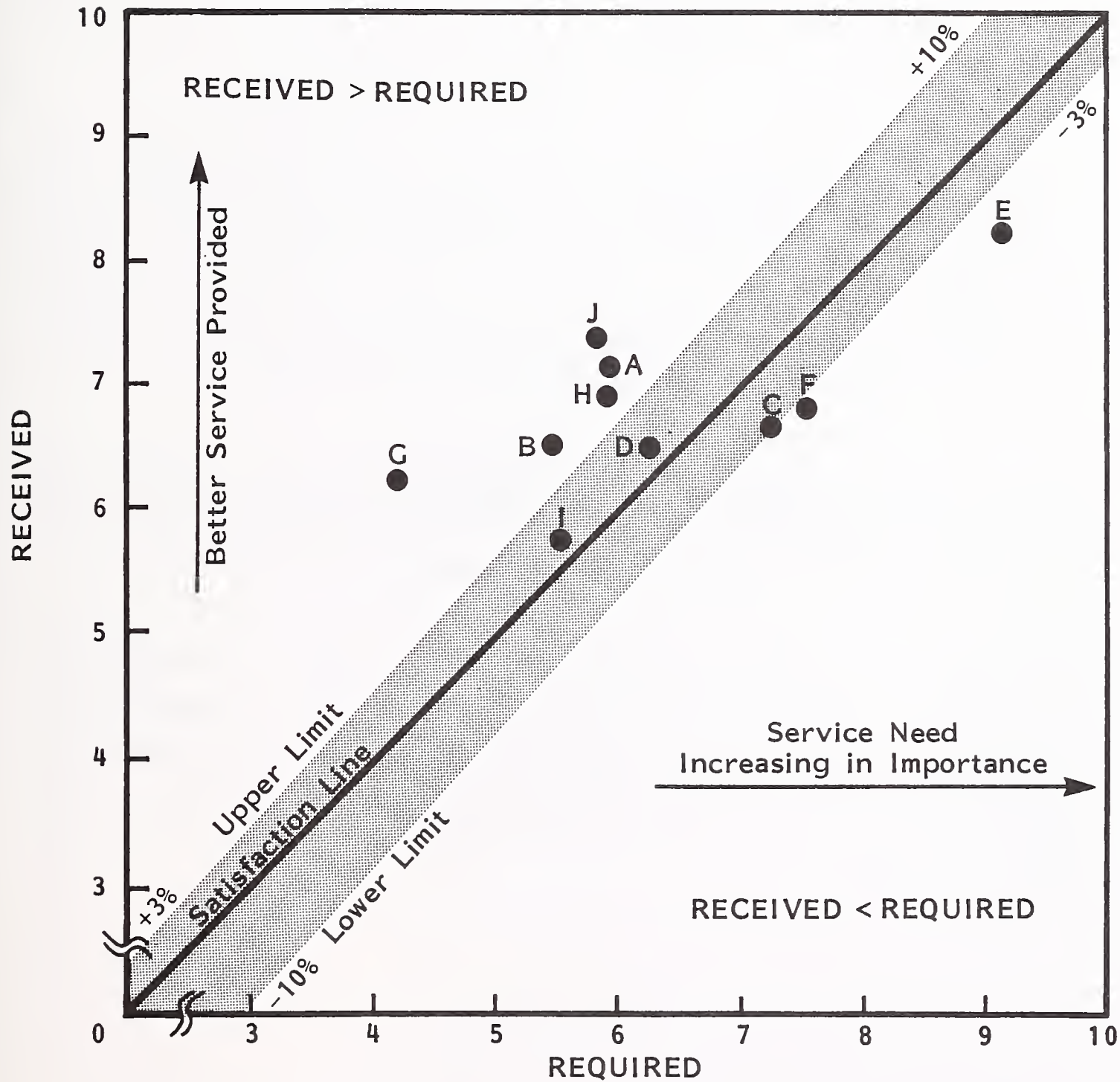
A = Planning   F = Software Maintenance
B = Consulting   G = Sale of Supplies
C = Documentation   H = Add-On Sales
D = Training   I = Site Audits
E = Hardware Maintenance   J = Relocation/Deinstallation

Rating: 1 = Low, 10 = High

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E.   MARKET SEGMENTATION - A MUST

- INPUT must re-emphasize the importance of detailed knowledge of the user base composition. Only in this way can the differing (specific) needs of the various user groups be addressed. Certainly it is difficult to raise customer satisfaction above an 85% overall satisfaction level with standard services: the last 15% would be very expensive to accomplish without some degree of customized services.

- The main reason for pursuing those users who are difficult to satisfy is the revenue potential they represent. The users that are not satisfied with standard service options usually have a good reason: their business is highly dependent on the continuous availability of computing power. This dependence translates into the need for above-average service - which corresponds to above-average revenue opportunities.

- Segmenting the large-system user base identifies which groups of users need extra attention and what their specific needs are. It also permits the maximization of revenue, user satisfaction, and customer services profit.

- Much of this knowledge is already captured and available - in the day-to-day experiences of the in-field engineer and support staff. Formatting and condensing this data is the first step in an action plan that every large-system vendor ought to have as part of an ongoing effort to optimize customer services business.

- 14 -

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EXHIBIT II-4

- 15 -

MARKET SEGMENTATION A MUST

- Know Your User Base's Composition - the Key to Profitable Operations

- Target High-Demand Business Segments for Improved Revenue and Customer Satisfaction

- Price Sensitivity Is Least Where User's Dependence on the Computer Is Greatest

- Emphasize High-Quality Service With Small Degree of Customization and Extended Service Options

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III VENDOR PERFORMANCE ANALYSIS

III VENDOR PERFORMANCE ANALYSIS

A. INTRODUCTION

- Users typically base their evaluations of overall service performance on just those few areas that are of particular importance to them. One user may feel that system availability is the most important performance criterion while another may feel that response time is the most important. While requirements appear to be highly individualistic, they can generally be divided into 10 broad categories. This chapter compares user requirements for service with the actual level of service received in these 10 categories.

- Since user requirements are measured against the average level of service provided, user responses cannot be interpreted as absolute values that allow direct comparisons between vendors. They do, however, show the strengths and weaknesses of each vendor and emphasize areas of opportunity in great detail.

- It is also important to understand that user requirements are not being measured against contractual service obligations. Users are being asked only to indicate whether the level of service they receive satisfies their requirement. Thus, while a vendor may be performing within the obligation of the service contract that is in effect, still the user may not be satisfied.

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- The 10 areas of performance evaluation listed below are by necessity both general and broad. For example, "Hardware Maintenance" includes a wide variety of particular services related to the hardware maintenance process. Performance on particular categories of service, such as hardware response time or software engineers communication, are evaluated in detail in later chapters. This chapter is intended as an overview of each vendor's performance in service and maintenance.

- The 10 areas of performance analysis are:

  - <u>Planning</u> - This category includes environmental, physical site, and installation planning services provided after contract signature.

  - <u>Consulting</u> - Includes problem solving, programming, and general consulting services offered by the vendor.

  - <u>Documentation</u> - All user manuals, newsletters, operation guides, and other printed or electronically transmitted data that are designed to assist the user in the operation of the vendor's equipment.

  - <u>Hardware Maintenance</u> - All services related to the maintenance of the vendor's system and associated peripherals and terminals.

  - <u>Software Maintenance</u> - All services related to the maintenance of the vendor's operating system software. (This is something of a misnomer, since what is carried out is software support rather than product modification).

  - <u>Sales of Supplies</u> - Consumable supplies, e.g., paper, ribbons, etc.

  - <u>Add-On Sales</u> - Add-on equipment sales, e.g., extra memory, disk drives, etc.

- 18 -

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- Site Audits - A periodic inventory of customer services provided by the vendor at a given customer site, including review of performance, contract validity, equipment serviced, etc.

- Relocation/Deinstallation - The physical movement or removal of the system, requiring a complete shutdown.

- Training - Materials and/or instruction in the use or operation of the hardware or systems software.

B.   AMDAHL SERVICE PERFORMANCE

- A total of 20 users of Amdahl 470 and 5860 equipment were surveyed in the 10 critical areas mentioned in section A, above. Of the 10 areas, eight are identical to those used in last year's questionnaire; this repetition allowed INPUT to develop historical and trend analysis.

- Exhibits III-1, III-2, and III-3 show Amdahl users' responses for level of services received, overall user level of satisfaction, and required level of service.

- Exhibit III-1 is most revealing, because it compares users' required level of service with the actual level of service received. Amdahl users reported an improved level of service received in every comparable category over 1983. Particularly strong gains were made in:

    - Consulting.

    - Training.

    - Hardware maintenance.

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EXHIBIT III-1

USER SERVICE REQUIREMENTS VERSUS LEVEL OF SERVICE RECEIVED
VENDOR: AMDAHL

TYPE OF SERVICE PROVIDED	AVERAGE LEVEL OF SERVICE			
	1984		1983	
	Required	Received	Required	Received
Planning	6.1	7.0	N/A	N/A
Consulting	6.9	7.3	5.7	6.4
Documentation	7.0	7.1	7.2	6.7
Training	7.5	7.7	7.3	6.7
Hardware Maintenance	9.4	8.9	9.1	8.0
Software Maintenance	7.6	7.5	7.5	4.9
Sales of Supplies	4.3	5.9	4.5	1.6
Add-On Sales	6.4	6.9	6.0	5.2
Site Audits	5.7	5.4	3.7	2.4
Relocation/Deinstallation	6.6	7.9	N/A	N/A

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EXHIBIT III-2

USER SERVICE REQUIREMENTS SATISFACTION LEVEL
VENDOR: AMDAHL

TYPE OF SERVICE	SATISFIED (User receives equal to or greater than required level of service) (Percent)	DISSATISFIED (User receives less than required level of service) (Percent)	NUMBER OF RESPONDENTS
Planning	82.4%	17.6%	17
Consulting	85.0	15.0	20
Documentation	73.7	26.3	19
Training	73.7	26.3	19
Hardware Maintenance	65.0	35.0	20
Software Maintenance	70.6	29.4	17
Sales of Supplies	92.3	7.7	13
Add-On Sales	82.4	17.6	17
Site Audits	58.8	41.2	17
Relocation/ Deinstallation	86.7	13.3	15

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EXHIBIT III-3

USER SATISFACTION WITH SERVICE RECEIVED/REQUIRED
VENDOR: AMDAHL
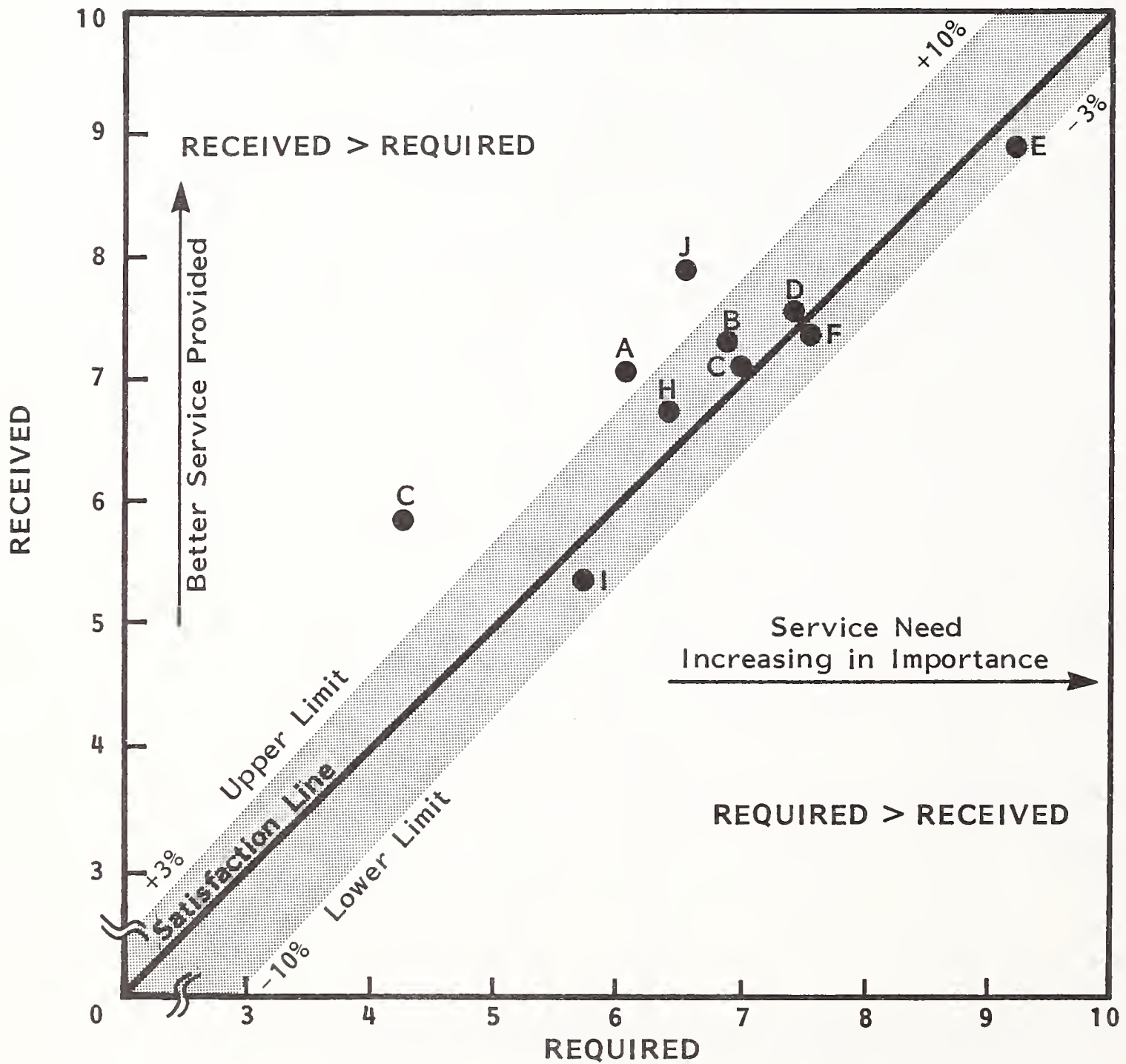
A = Planning   F = Software Maintenance
B = Consulting   G = Sale of Supplies
C = Documentation   H = Add-On Sales
D = Training   I = Site Audits
E = Hardware Maintenance   J = Relocation/Deinstallation

Rating: 1 = Low, 10 = High

- 22 -

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- Software maintenance.

- Sales of supplies.

- Site audits.

- It is interesting to note that while the average level of service received improved, so did the average level of service required. Consequently, the overall satisfaction level did not change significantly. Requirements for service increased dramatically in the area of consulting, but actually dropped for documentation, and sales of supplies. Other requirements for service stayed basically the same from 1983 to 1984.

- Exhibit III-2 shows the level of user satisfaction with Amdahl service. As a whole, Amdahl users are much more satisfied with the service they are receiving than is the average user of large systems, as shown in Exhibit II-2. Amdahl users report lower than average satisfaction levels only in the area of site audits (58.8% satisfied, as opposed to the large-systems average of 74.8%). While the majority of Amdahl users are satisfied with service, there are substantial numbers of dissatisfied users, especially in the areas of:

  - Documentation (26% dissatisfied).

  - Training (26% dissatisfied).

  - Hardware maintenance (35% dissatisfied).

  - Software maintenance (29% dissatisfied).

  - Site audits (41% dissatisfied).

- 23 -

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- Improvement in hardware maintenance is probably the most urgently needed change. Thirty percent of the users who responded indicated that increased training of the hardware engineer was the single most important change Amdahl could make; 20% recommended that remote diagnostics be improved; 30% said parts availability/distribution needed improvement.

- Dissatisfaction with site audits increased dramatically in 1984. This is clearly an area in which problems must be confronted.

- Exhibit III-3 graphically displays the relationship between required and received levels of service. It is clear from this exhibit that Amdahl users are generally satisfied with the service they are receiving. Users are receiving significant overkill service (i.e., service significantly better than they require) in two areas: sale of supplies and relocation/deinstallation. Amdahl could reduce service in these areas without effecting overall user satisfaction levels.

C.   BURROUGHS SERVICE PERFORMANCE

- Thirty-one users of Burroughs large systems (B59XX, B6XXX, B7XXX) were interviewed in 1984, an increase over last year's survey. Exhibits III-4, III-5, and III-6 list user responses in the 10 areas of Burroughs service performance.

- Exhibit III-4 displays a comparison between the average levels of service required and received for 1984 and 1983. General conclusions drawn from this data are:

    - Overall requirements for services dropped in 1984 (except for hardware and software maintenance).

    - The average level of service received increased substantially.

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EXHIBIT III-4

USER SERVICE REQUIREMENTS VERSUS LEVEL OF SERVICE RECEIVED
VENDOR: BURROUGHS

TYPE OF SERVICE PROVIDED	AVERAGE LEVEL OF SERVICE			
	1984		1983	
	Required	Received	Required	Received
Planning	4.9	6.8	N/A	N/A
Consulting	4.5	6.2	5.0	4.8
Documentation	7.0	5.4	7.4	5.0
Training	5.9	5.6	7.2	6.0
Hardware Maintenance	9.3	7.9	9.1	7.6
Software Maintenance	8.1	7.4	7.8	5.8
Sales of Supplies	3.8	6.7	6.0	4.8
Add-On Sales	5.9	7.1	6.5	6.0
Site Audits	4.4	6.1	5.0	4.3
Relocation/Deinstallation	3.6	7.5	N/A	N/A

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EXHIBIT III-5

USER SERVICE REQUIREMENTS SATISFACTION LEVEL
VENDOR: BURROUGHS

TYPE OF SERVICE	SATISFIED (User receives equal to or greater than required level of service) (Percent)	DISSATISFIED (User receives less than required level of service) (Percent)	NUMBER OF RESPONDENTS
Planning	79.2%	20.8%	24
Consulting	75.0	25.0	24
Documentation	41.4	58.6	29
Training	50.0	50.0	28
Hardware Maintenance	41.9	58.1	31
Software Maintenance	39.3	60.7	28
Sales of Supplies	95.5	4.5	22
Add-On Sales	57.7	42.3	26
Site Audits	81.0	19.0	21
Relocation/ Deinstallation	100.0	0.0	19

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EXHIBIT III-6

USER SATISFACTION WITH SERVICE RECEIVED/REQUIRED
VENDOR: BURROUGHS
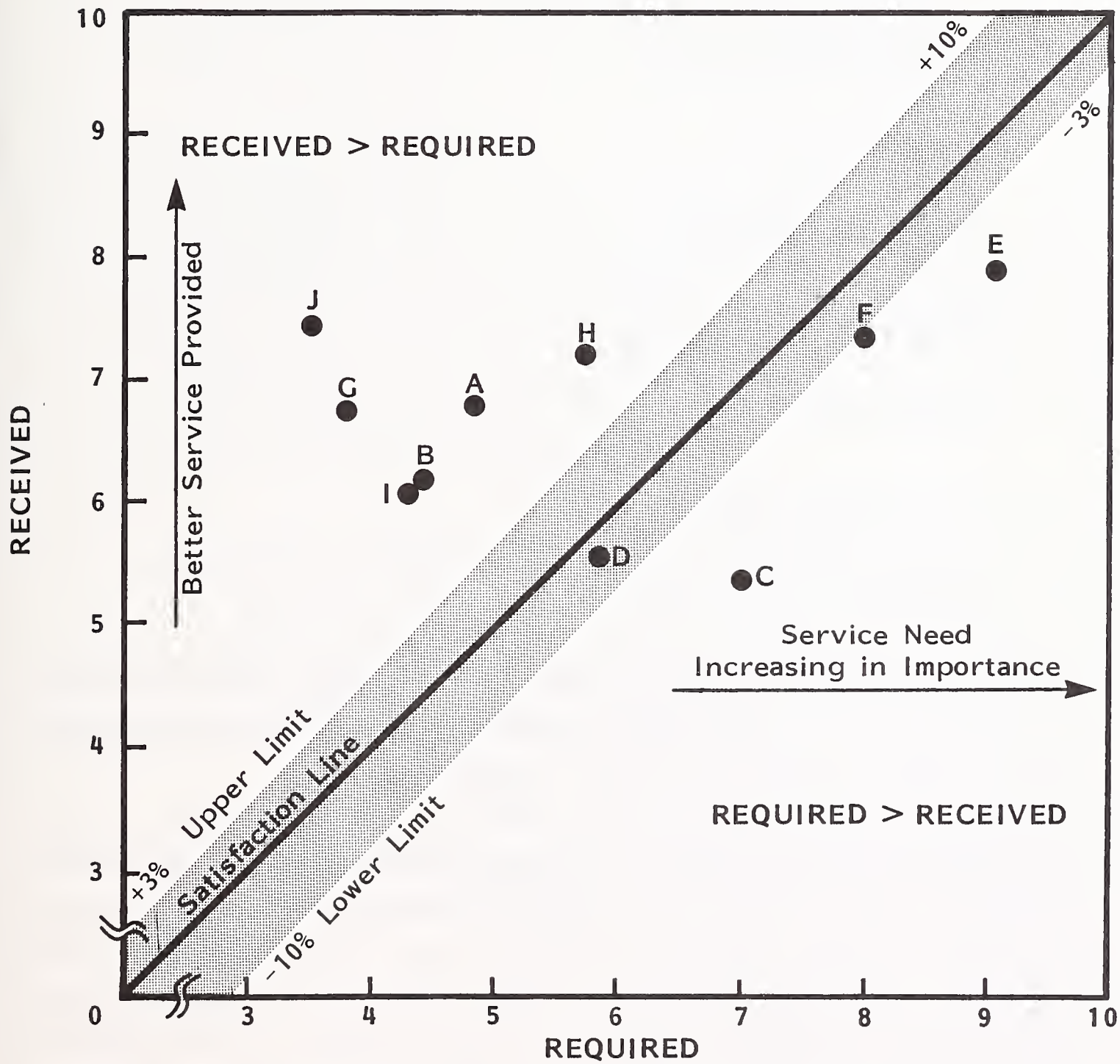
A = Planning	F = Software Maintenance
B = Consulting	G = Sale of Supplies
C = Documentation	H = Add-On Sales
D = Training	I = Site Audits
E = Hardware Maintenance	J = Relocation/Deinstallation

Rating: 1 = Low, 10 = High

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- User satisfaction in most areas increased dramatically, though there is still substantial user dissatisfaction.

• Burroughs users reported good gains in the level of service received in most post-sales support:

    - Hardware maintenance.

    - Consulting.

    - Software maintenance.

    - Sales of supplies.

    - Site audits.

• Service fell, however, in one crucial area:

    - Training.

• Despite solid gains in service provided, the average level of service received by Burroughs users continues below the industry norm for planning, consulting, documentation, training, and hardware maintenance.

• Burroughs received particularly low ratings in several key areas and must now struggle to regain its image in these areas. For example, users reported that when their training needs went unmet last year (1983 requirement = 7.2; received = 6.0), they were forced to use non-Burroughs training services. Consequently, in 1984 the demand for training services from Burroughs has been reduced significantly. Users mentioned similar occurrences in supplies, add-on sales, and site audits.

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- Users who have remained with Burroughs report higher satisfaction levels than in 1983, as shown in Exhibit III-5. In the important areas of hardware and software maintenance, however, satisfaction levels are far below the norm.

- Exhibit III-6 demonstrates the wide variation between user requirements for service and the level of service actually received from Burroughs. Users felt that Burroughs was overcompensating in low-requirement areas, especially relocation services and sale of supplies, and undercompensating for more important requirements, such as documentation and hardware maintenance.

- While users acknowledge that Burroughs is making significant headway in service support, they are critical of some service priorities. For example, satisfaction with a low-requirement area, relocation services, increased from 75% to 100% in 1983-1984, while a high priority requirement, hardware maintenance, received very little added attention in 1983-1984 (satisfaction was 39.3% in 1983 and only 41.9% in 1984). Several users commented specifically on the need to reprioritize service.

- Surprisingly, Burroughs users are very understanding about the company's service dilemma. Users are also impressed with the significant gains made by the company in service. Still, they are not satisfied with the service they are receiving, particularly in high-requirement areas such as documentation, training, hardware, and software maintenance.

- If Burroughs does not make substantial improvement in high-requirement service areas, the company will be inviting service competition and, ultimately, an eroded customer base.

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D. CONTROL DATA CORPORATION SERVICE PERFORMANCE

- Thirty-six users of CDC large systems (170 series, 205 series, and Omega 1480) were interviewed in 1984, also an increase over 1983's survey.

- Exhibit III-7 lists the user service requirements versus the level of service actually received for both 1984 and 1983. As the exhibit demonstrates:

    - User requirements for service have generally increased between 1983 and 1984.

    - The level of service received has improved and, in most cases, exceeds user demands.

    - Further improvements must be made in the following service areas:

        . Documentation.

        . Training.

        . Hardware maintenance.

        . Software maintenance.

- CDC has made impressive headway in improving the level of service despite substantial increases in service requirements by their users. User requirements for service increased from 1983 to 1984 in all areas except, surprisingly, hardware maintenance.

- User satisfaction with service is shown in Exhibit III-8. Despite improvements, CDC still falls below the industry norm for satisfaction levels in 8 out of 10 categories. The number of dissatisfied users is uncomfortably high in the following five areas:

EXHIBIT III-7

USER SERVICE REQUIREMENTS VERSUS LEVEL OF SERVICE RECEIVED
VENDOR: CDC

| TYPE OF SERVICE PROVIDED	AVERAGE LEVEL OF SERVICE			
	1984		1983	
	Required	Received	Required	Received
Planning	6.5	7.2	N/A	N/A
Consulting	6.3	6.7	N/A	5.5
Documentation	8.0	6.7	6.5	5.5
Training	6.9	7.0	6.3	5.8
Hardware Maintenance	8.8	8.2	8.9	7.8
Software Maintenance	6.9	6.3	6.2	5.4
Sales of Supplies	3.8	6.9	4.3	3.3
Add-On Sales	6.9	7.3	5.9	6.3
Site Audits	5.6	6.1	3.8	3.7
Relocation/Deinstallation	6.7	7.5	N/A	N/A

INPUT
FLS5

EXHIBIT III-8

USER SERVICE REQUIREMENTS SATISFACTION LEVEL

VENDOR: CDC

TYPE OF SERVICE	SATISFIED (User receives equal to or greater than required level of service) (Percent)	DISSATISFIED (User receives less than required level of service) (Percent)	NUMBER OF RESPONDENTS
Planning	58.1%	41.9%	31
Consulting	71.9	28.1	32
Documentation	27.8	72.2	36
Training	51.6	48.4	31
Hardware Maintenance	51.4	48.6	35
Software Maintenance	50.0	50.0	28
Sales of Supplies	77.8	22.2	18
Add-On Sales	70.6	29.4	34
Site Audits	70.4	29.6	27
Relocation/ Deinstallation	81.5	18.5	27

INPU
FLS5

-        Planning - 41.9% of users dissatisfied with service.

-        Documentation - 72.2% of users dissatisfied with service.

-        Training - 48.4% of users dissatisfied with service.

-        Hardware maintenance - 48.6% of users dissatisfied with service.

-        Software maintenance - 50% of users dissatisfied with service.

- The large number of dissatisfied users listed in Exhibit III-8 seems to contradict the generally favorable average level of service received by users described in Exhibit III-7. This is explained by the fact that satisfied users tended to give CDC extremely high ratings with regard to service received (which offsets some of the more negative ratings).

- Hardware and software maintenance are two important areas that must be improved by CDC. Over 60% of the users who responded said that improvements in software maintenance or support were the most important changes CDC could make. Twenty-four percent said hardware support improvement was the most important change.

- Another area that requires immediate attention from CDC is documentation. While only 37.5% were dissatisfied with documentation in 1983, the number almost doubled to 72.2% in 1984. Furthermore, all 36 users reported that they required documentation, the highest response level for any CDC service.

- Exhibit III-9 indicates that there are areas where CDC can conserve service resources. These are sales of supplies and relocation/deinstallation. Service in these areas can be reduced without damaging customer satisfaction levels and will free up extra resources to bolster documentation, an area that must be improved if CDC is to maintain and expand its customer base.

INPUT

EXHIBIT III-9

USER SATISFACTION WITH SERVICE RECEIVED/REQUIRED
VENDOR: CDC
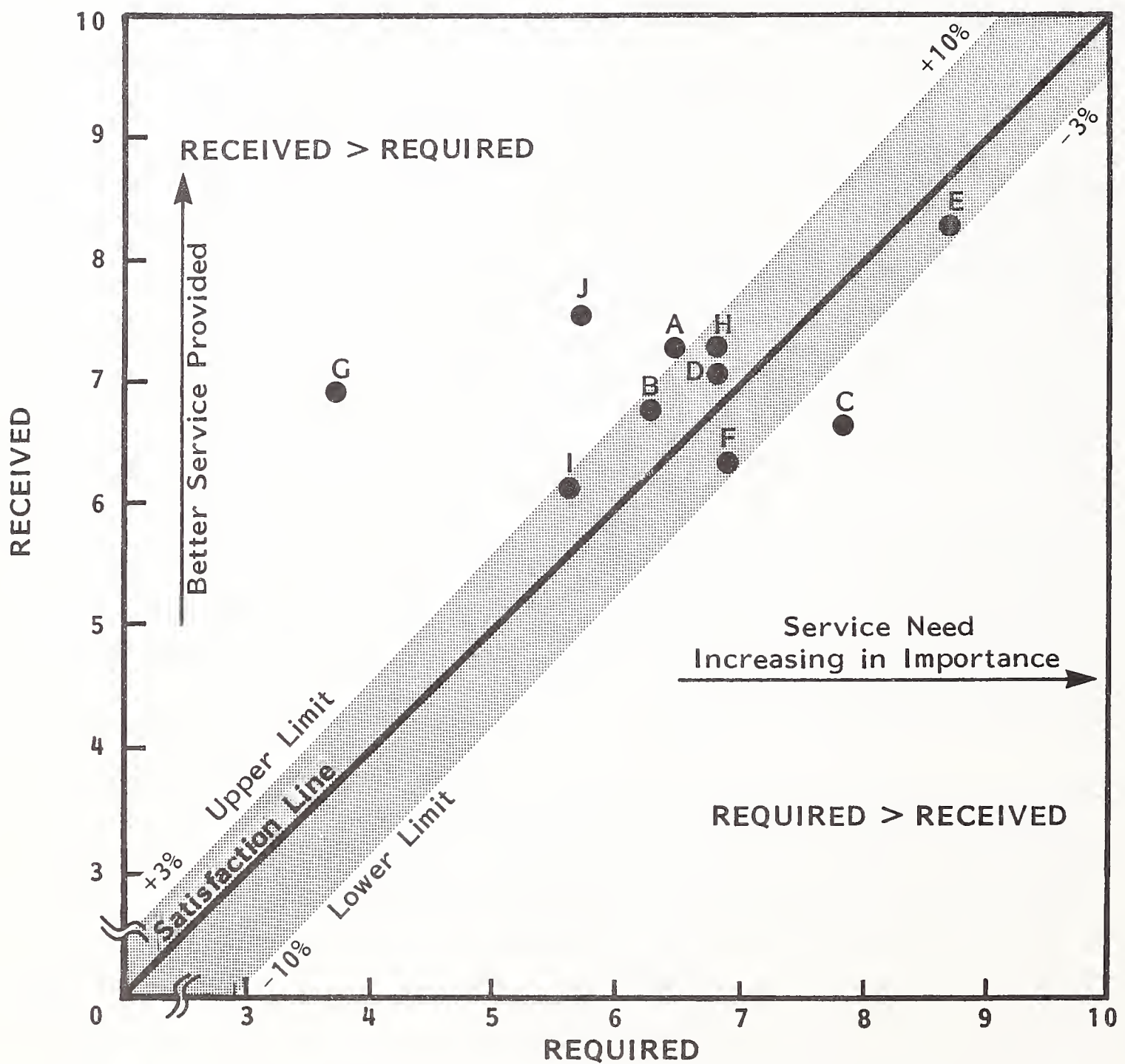
A = Planning   F = Software Maintenance
B = Consulting   G = Sale of Supplies
C = Documentation   H = Add-On Sales
D = Training   I = Site Audits
E = Hardware Maintenance   J = Relocation/Deinstallation

Rating: 1 = Low, 10 = High

INP

E.   CRAY SERVICE PERFORMANCE

- Nine users of Cray-1 computers were interviewed in 1984. Exhibits III-10 to III-12 list the user ratings for service performance from Cray.

- As Exhibit III-10 suggests, users of Cray equipment reported an overall decrease in the level of service received in 1984 as opposed to 1983. Requirements for service remained substantially the same in 1984 as in 1983.

- Users indicated that service had declined dramatically in several areas, including consulting, documentation, training, and software maintenance. Service was reported to have improved in sales of supplies and site audits.

- Exhibit III-11 lists user satisfaction levels with major services provided by Cray. As might be expected from the service required/received data in the previous exhibit, satisfaction levels are not high.

- More attention must be paid to software maintenance. User dissatisfaction levels in this area have increased from 50% in 1983 to 80% in 1984. Dissatisfaction with documentation and consulting has also increased substantially.

- Exhibit III-12 graphically displays user dissatisfaction with Cray service.

F.   DATA GENERAL SERVICE PERFORMANCE

- Twenty-five users of Data General large systems (MV4000, 6000, 8000, 10000) were interviewed in 1984, an increase over the 1983 survey.

- Overall level of service increased substantially in 1984, as shown in Exhibit III-13. Particularly strong gains were made in several problem areas, in-

- 35 -

INPUT

EXHIBIT III-10

USER SERVICE REQUIREMENTS VERSUS LEVEL OF SERVICE RECEIVED
VENDOR: CRAY

TYPE OF SERVICE PROVIDED	AVERAGE LEVEL OF SERVICE			
	1984		1983	
	Required	Received	Required	Received
Planning	6.7	5.6	N/A	N/A
Consulting	5.4	4.3	7.6	8.4
Documentation	7.1	5.4	8.4	8.2
Training	6.8	5.8	6.7	7.0
Hardware Maintenance	8.7	7.9	9.1	8.7
Software Maintenance	8.2	5.8	7.7	7.4
Sales of Supplies	5.3	5.3	4.8	3.4
Add-On Sales	6.0	6.4	5.0	6.5
Site Audits	4.7	3.7	4.7	3.4
Relocation/Deinstallation	6.9	6.8	N/A	N/A

INPl
FLS5

EXHIBIT III-11

USER SERVICE REQUIREMENTS SATISFACTION LEVEL

VENDOR: CRAY

TYPE OF SERVICE	SATISFIED (User receives equal to or greater than required level of service) (Percent)	DISSATISFIED (User receives less than required level of service) (Percent)	NUMBER OF RESPONDENTS
Planning	55.6%	44.4%	9
Consulting	44.4	55.6	9
Documentation	33.3	66.7	9
Training	62.5	37.5	8
Hardware Maintenance	55.6	44.4	9
Software Maintenance	20.0	80.0	5
Sales of Supplies	88.9	11.1	9
Add-On Sales	77.8	22.2	9
Site Audits	66.7	33.3	6
Relocation/ Deinstallation	88.9	11.1	9

INPUT
FLS5

EXHIBIT III-12

USER SATISFACTION WITH SERVICE RECEIVED/REQUIRED
VENDOR: CRAY
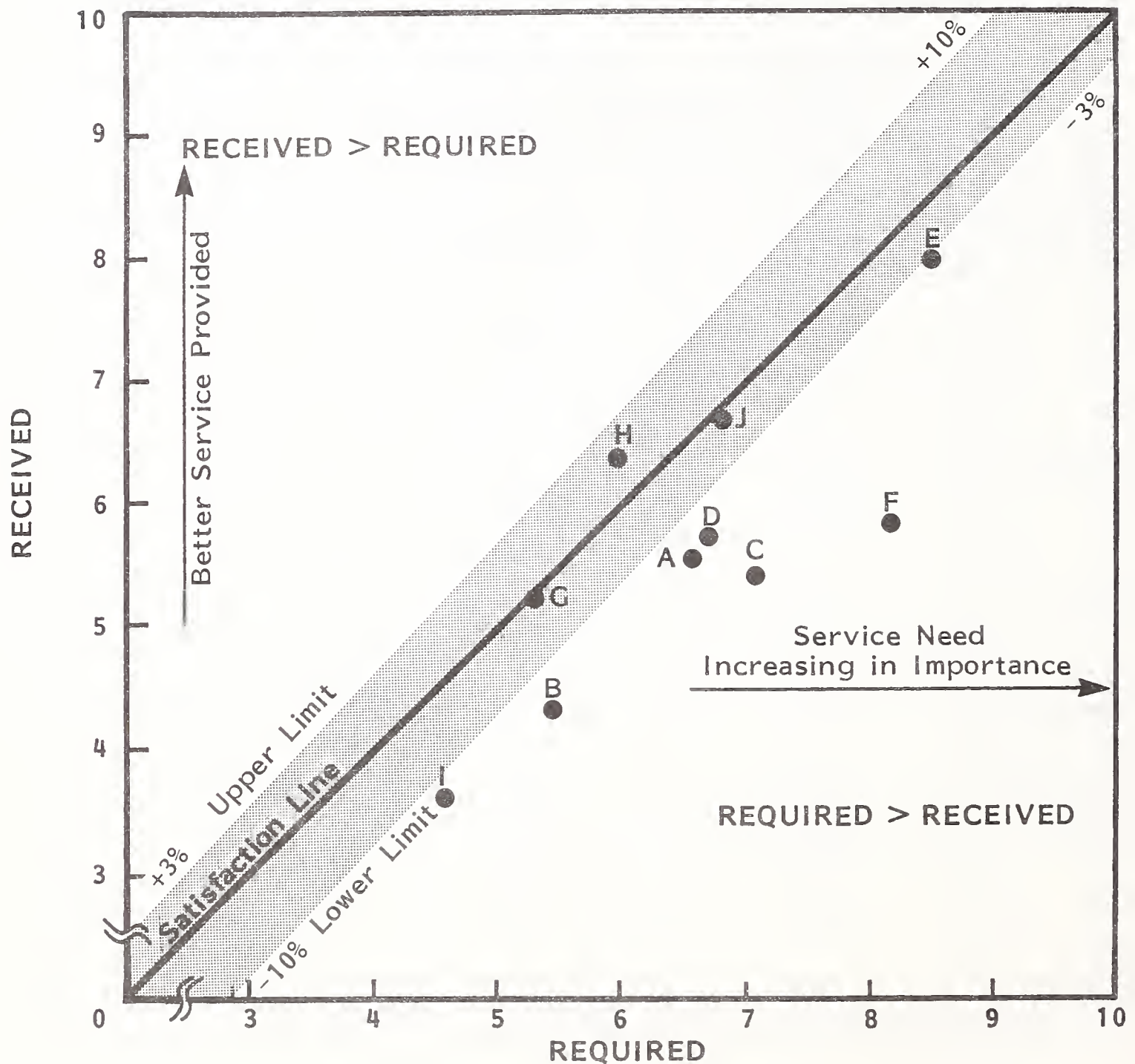
A = Planning   F = Software Maintenance
B = Consulting   G = Sale of Supplies
C = Documentation   H = Add-On Sales
D = Training   I = Site Audits
E = Hardware Maintenance J = Relocation/Deinstallation

Rating: 1 = Low, 10 = High

INP

EXHIBIT III-13

- 39 -

USER SERVICE REQUIREMENTS VERSUS LEVEL OF SERVICE RECEIVED
VENDOR: DATA GENERAL

TYPE OF SERVICE PROVIDED	AVERAGE LEVEL OF SERVICE			
	1984		1983	
	Required	Received	Required	Received
Planning	5.4	6.5	N/A	N/A
Consulting	3.6	6.3	3.6	4.8
Documentation	6.0	6.2	7.2	5.3
Training	4.4	6.3	6.0	4.8
Hardware Maintenance	9.2	7.8	8.5	8.2
Software Maintenance	7.3	6.4	6.3	4.6
Sales of Supplies	3.1	4.4	4.6	2.9
Add-On Sales	6.2	6.6	4.7	4.3
Site Audits	3.2	6.2	2.8	2.3
Relocation/Deinstallation	4.8	7.2	N/A	N/A

INPUT
FLS5

cluding documentation, training, software maintenance, sales of supplies, add-on sales, and site audits.

- Data General users reported that the level of service received exceeded their requirement in all but two areas. Unfortunately, both of these areas are of critical importance to users: software and hardware maintenance.

- Dissatisfaction with software and hardware maintenance is also shown in Exhibit III-14. Over 70% of the users requiring software maintenance were not satisfied with the service they received. Almost 25% of the Data General users who responded said that improvement in software support was the single most important change Data General could make. Eighteen percent said instead that hardware support was the most important change that could be made.

- Even though the average level of service provided generally exceeds user requirements, user dissatisfaction with Data General's service is still substantially above the norm. For example, 41.2% of Data General users are dissatisfied with planning services versus a 24.1% dissatisfaction rate for all users, as shown in Exhibit II-2.

- This high rate of dissatisfaction among Data General users must not be ignored simply because the average level of service is adequate. Dissatisfied users are a majority in 7 of the 10 service areas in Exhibit III-14. The fact that extremely satisfied users have elevated the average service level response rate should not prevent the company from redoubling efforts to improve service, particularly in:

  - Software maintenance.

  - Hardware maintenance.

  - Consulting.

- 40 -

INP

EXHIBIT III-14

- 41 -

USER SERVICE REQUIREMENTS SATISFACTION LEVEL
VENDOR: DATA GENERAL

TYPE OF SERVICE	SATISFIED (User receives equal to or greater than required level of service) (Percent)	DISSATISFIED (User receives less than required level of service) (Percent)	NUMBER OF RESPONDENTS
Planning	58.8%	41.2%	17
Consulting	41.7	58.3	12
Documentation	47.6	52.4	21
Training	50.0	50.0	14
Hardware Maintenance	37.5	62.5	24
Software Maintenance	27.8	72.2	18
Sales of Supplies	30.0	70.0	10
Add-On Sales	45.0	55.0	20
Site Audits	75.0	25.0	12
Relocation/ Deinstallation	75.0	25.0	16

INPUT
FLS5

-    Sales of supplies.

• Exhibit III-15 demonstrates the improvements that have been made in selected service categories.

G.   DEC SERVICE PERFORMANCE

• Forty-one DEC large system users were interviewed in 1984, as opposed to 30 in 1983. DEC large systems included DEC-10, DEC-20, and the VAX 11/7XX series.

• As shown in Exhibit III-16, users reported that DEC performed very well in most service categories, despite generally increasing user requirements for services. In 1984 users indicated that they received a higher level of service than was required in 7 of 10 service areas. In 1983, service received was greater than that required in only 7 of 13 areas.

• Like most other manufacturers, DEC must pay more attention to such crucial areas as documentation, hardware maintenance, and software maintenance. A large portion of users reported that their requirements for service are not being met in these three areas.

• It is interesting to note in Exhibit III-17 that even though users' requirements for software maintenance are not being met, the majority of users are satisfied with the service they are receiving in this area. One reason for this satisfaction is that users realize that service in this area has improved dramatically since 1983 and they anticipate a continued increase in service in 1984.

- 42 -

EXHIBIT III-15

USER SATISFACTION WITH SERVICE RECEIVED/REQUIRED
VENDOR: DATA GENERAL
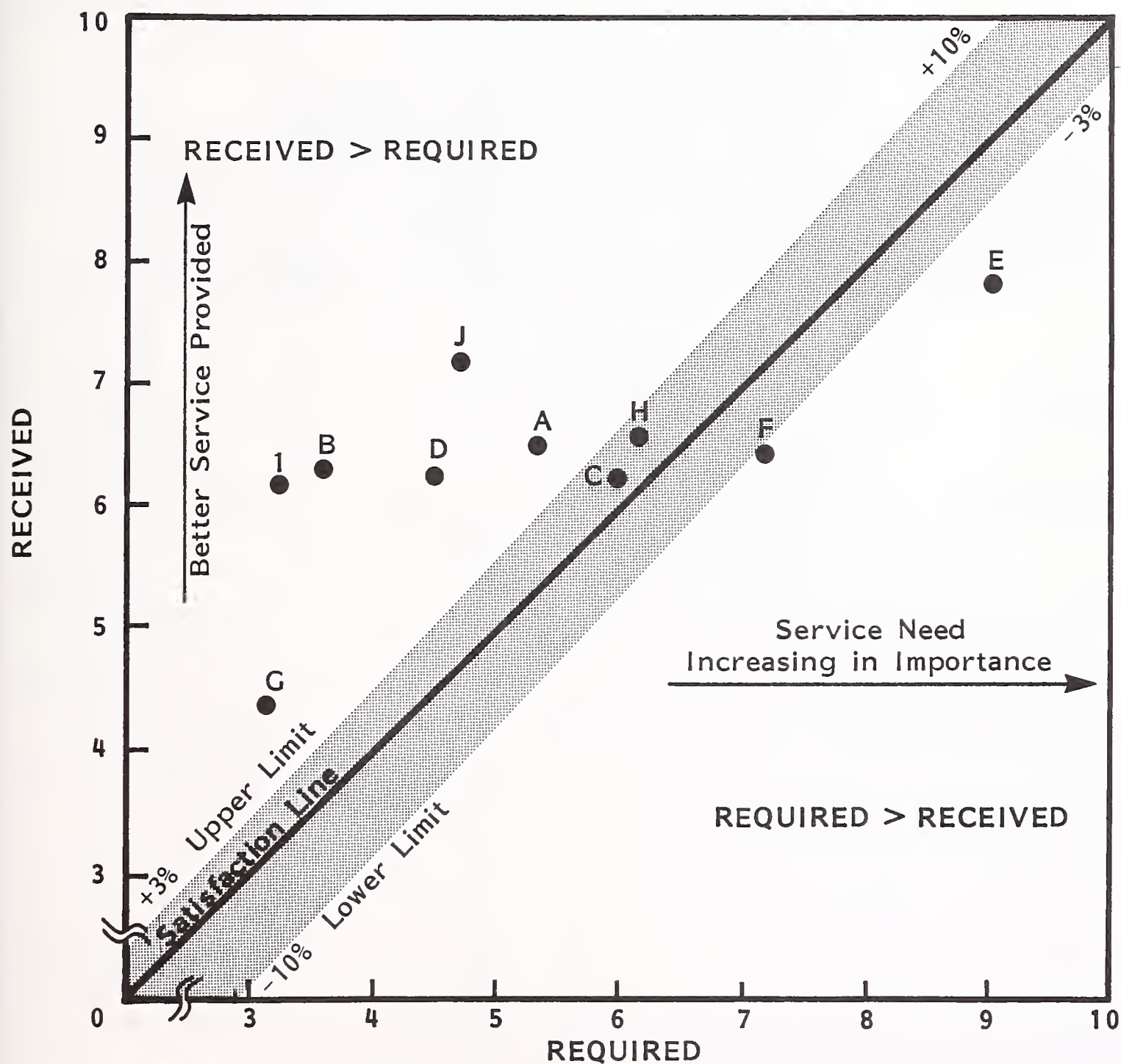
A = Planning   F = Software Maintenance
B = Consulting   G = Sale of Supplies
C = Documentation   H = Add-On Sales
D = Training   I = Site Audits
E = Hardware Maintenance   J = Relocation/Deinstallation

Rating: 1 = Low, 10 = High

INPUT

EXHIBIT III-16

USER SERVICE REQUIREMENTS VERSUS LEVEL OF SERVICE RECEIVED
VENDOR: DEC

TYPE OF SERVICE PROVIDED	AVERAGE LEVEL OF SERVICE			
	1984		1983	
	Required	Received	Required	Received
Planning	5.9	6.4	N/A	N/A
Consulting	5.6	6.3	4.7	4.7
Documentation	7.9	7.7	7.5	7.0
Training	6.1	7.0	5.8	6.4
Hardware Maintenance	9.1	8.2	9.2	7.4
Software Maintenance	7.0	6.2	6.7	4.9
Sales of Supplies	3.6	6.4	4.6	4.9
Add-On Sales	6.3	6.8	5.8	5.3
Site Audits	4.1	5.5	3.7	3.3
Relocation/Deinstallation	5.3	7.3	N/A	N/A

INPU
FLS5

EXHIBIT III-17

USER SERVICE REQUIREMENTS SATISFACTION LEVEL
VENDOR: DEC

TYPE OF SERVICE	SATISFIED (User receives equal to or greater than required level of service) (Percent)	DISSATISFIED (User receives less than required level of service) (Percent)	NUMBER OF RESPONDENTS
Planning	62.9%	37.1%	35
Consulting	63.9	36.1	35
Documentation	47.5	52.5	40
Training	72.2	27.8	36
Hardware Maintenance	43.3	53.7	41
Software Maintenance	60.6	39.4	33
Sales of Supplies	80.0	20.0	25
Add-On Sales	62.9	37.1	35
Site Audits	54.2	45.8	24
Relocation/ Deinstallation	79.3	20.7	29

INPUT
FLS5

- A potential problem for DEC is in the number of users dissatisfied with hardware maintenance. These dissatisfied users increased from 46.7% in 1983 to 53.7% in 1984. Dissatisfaction in this area is a principal cause for growing interest among DEC users in single-source and third-party maintenance (discussed in Chapter V).

- Dissatisfaction also grew dramatically with respect to documentation (36.7% dissatisfied in 1983, 52.5% in 1984) and site audits (23.3% in 1983, 45.8% in 1984).

- Satisfaction with training services, sales of supplies, and relocation services continued to be very high.

- Exhibit III-18 indicates that DEC may be providing a greater service level than necessary in a number of areas, particularly sales of supplies and relocation services. Services in these areas could be reduced without damaging customer satisfaction levels.

- Services in other categories in Exhibit III-18, such as site audits, training, and consulting, could also be redirected to satisfy a larger number of users.

H. HONEYWELL SERVICE PERFORMANCE

- Forty-four users of Honeywell large systems (66 DPS, DPS 7, DPS 8) were interviewed in 1984, an increase of 11 over 1983.

- Honeywell users reported a higher level of satisfaction with overall service in 1984 than in 1983. Exhibit III-19 shows that service ratings improved dramatically in:

    - Software maintenance.

- 46 -

EXHIBIT III-18

USER SATISFACTION WITH SERVICE RECEIVED/REQUIRED
VENDOR: DEC
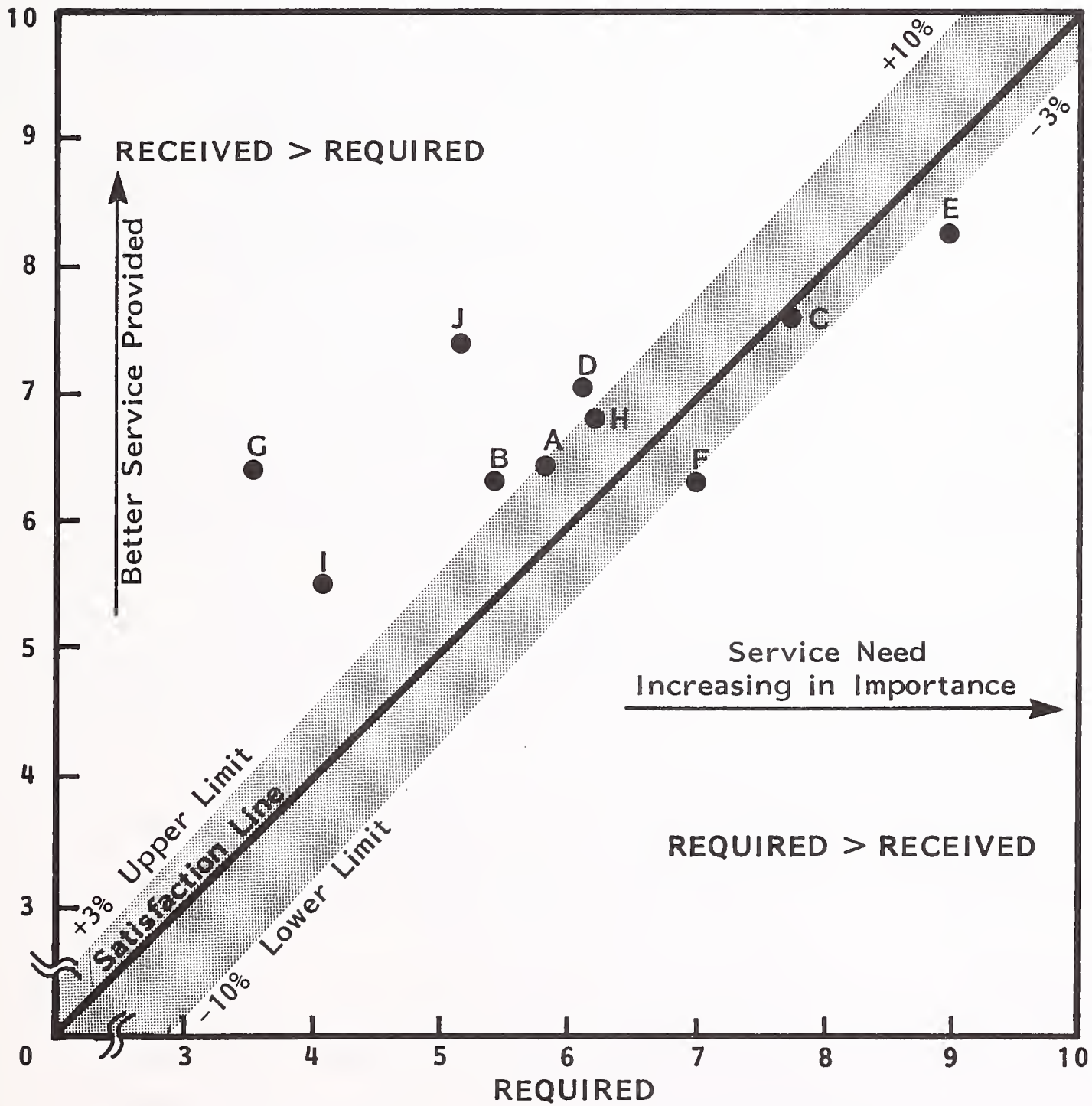
A = Planning   F = Software Maintenance
B = Consulting   G = Sale of Supplies
C = Documentation   H = Add-On Sales
D = Training   I = Site Audits
E = Hardware Maintenance   J = Relocation/Deinstallation

Rating: 1 = Low, 10 = High

INPUT

EXHIBIT III-19

USER SERVICE REQUIREMENTS VERSUS LEVEL OF SERVICE RECEIVED
VENDOR: HONEYWELL

TYPE OF SERVICE PROVIDED	AVERAGE LEVEL OF SERVICE			
	1984		1983	
	Required	Received	Required	Received
Planning	5.4	6.7	N/A	N/A
Consulting	5.0	5.8	5.1	5.6
Documentation	7.1	6.2	8.4	6.7
Training	6.3	6.3	7.0	5.9
Hardware Maintenance	8.9	7.7	9.2	7.9
Software Maintenance	8.3	7.7	6.8	5.7
Sales of Supplies	4.0	7.0	4.8	4.1
Add-On Sales	7.0	7.7	7.0	6.3
Site Audits	4.8	6.1	4.8	3.5
Relocation/Deinstallation	5.7	7.1	N/A	N/A

INPUT
FLS5

- Sales of supplies.

- Add-On sales.

- Site audits.

- Problems remain in the following areas:

  - Documentation.

  - Hardware maintenance.

- Honeywell users' satisfaction/dissatisfaction levels are reflected in Exhibit III-20. As noted above, documentation and hardware maintenance continue to show unacceptable dissatisfaction rates. Dissatisfaction with hardware maintenance increased from 57.6% in 1983 to 58.1% in 1984. While dissatisfaction with documentation fell in 1984, it still remains at a high 56.1%.

- As noted above, substantial improvements were made in sales of supplies (dissatisfaction reduced from 36.4% in 1983 to 21.4% in 1984) and site audits (39.4% in 1983, 21.4% in 1984).

- Over the past year Honeywell user satisfaction has increased in 9 of the 10 categories listed in Exhibit III-20. Unfortunately, user satisfaction fell in the all-important area of hardware maintenance.

- Exhibit III-21 indicates that in several areas, users are receiving substantially more support than they require. Service levels in planning, relocation/de-installation, site audits, and supply sales can all be reduced without a substantial effect on user satisfaction.

- 49 -

INPUT

EXHIBIT III-20

USER SERVICE REQUIREMENTS SATISFACTION LEVEL
VENDOR: HONEYWELL

TYPE OF SERVICE	SATISFIED (User receives equal to or greater than required level of service) (Percent)	DISSATISFIED (User receives less than required level of service) (Percent)	NUMBER OF RESPONDENTS
Planning	77.8%	22.2%	36
Consulting	77.8	22.2	36
Documentation	43.9	56.1	41
Training	65.8	34.2	38
Hardware Maintenance	41.9	58.1	43
Software Maintenance	55.3	44.7	38
Sales of Supplies	78.6	21.4	28
Add-On Sales	74.4	25.6	39
Site Audits	78.6	21.4	28
Relocation/ Deinstallation	81.8	18.2	22

EXHIBIT III-21

USER SATISFACTION WITH SERVICE RECEIVED/REQUIRED
VENDOR: HONEYWELL
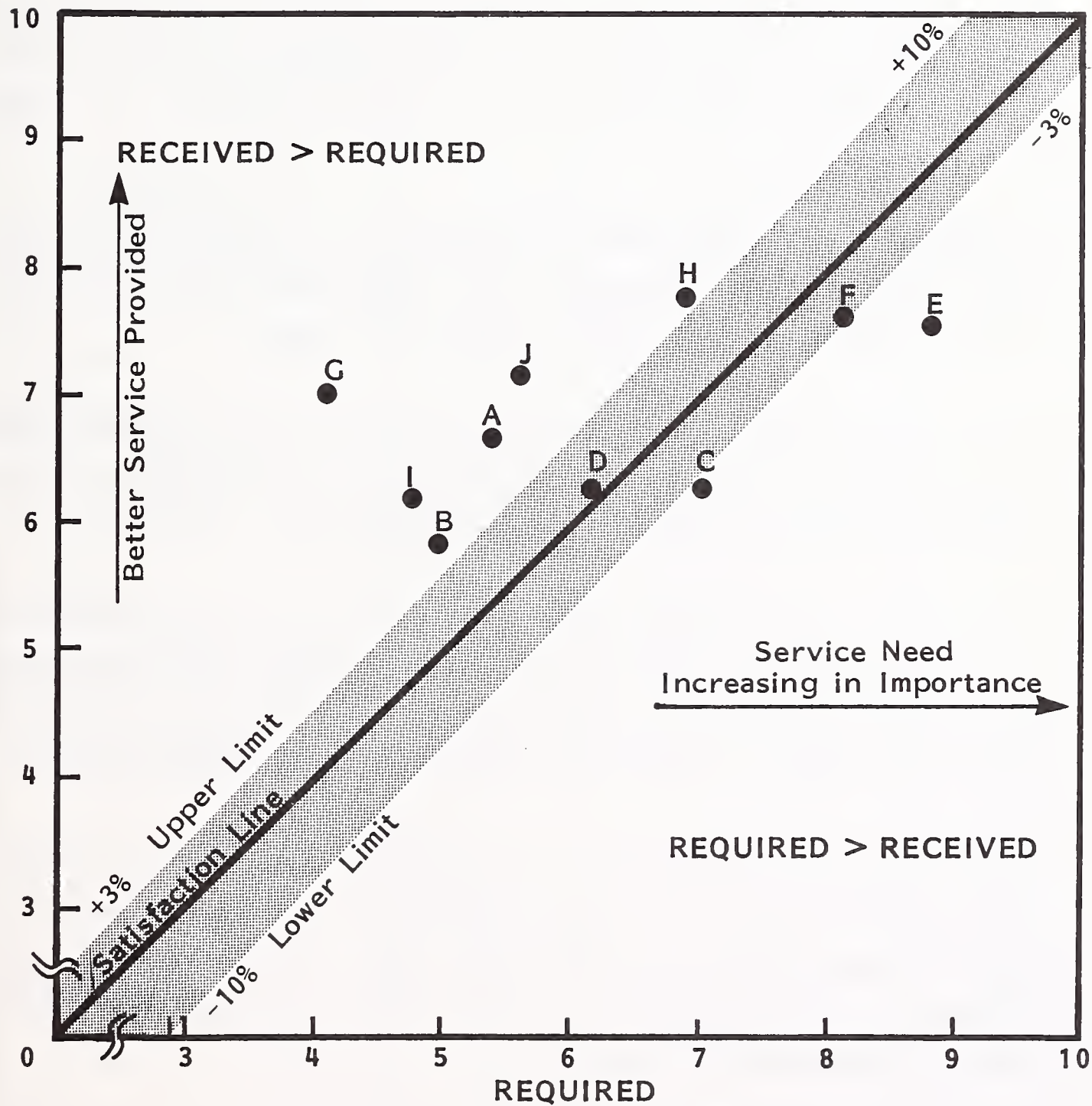
A = Planning   F = Software Maintenance
B = Consulting   G = Sale of Supplies
C = Documentation   H = Add-On Sales
D = Training   I = Site Audits
E = Hardware Maintenance   J = Relocation/Deinstallation

Rating: 1 = Low, 10 = High

INPUT

I.   IBM SERVICE PERFORMANCE

● Fifty-one users of IBM large system (308X, 303X, 43XX) were interviewed in 1984, as opposed to fifty-three in 1983.

● Exhibit III-22 indicates that the average level of service received by IBM users has increased in 4 of the 10 categories. More importantly, service has either been maintained or increased in such crucial areas as hardware and software maintenance.

● Surprisingly, users reported a lower requirement for service in 1984 than in 1983. The requirement for training services fell from 7.5 in 1983 to 6.9 in 1984; sales of supplies fell from 5.9 in 1983 to 4.7 in 1984.

● What is significant about IBM service is the accuracy with which IBM judges their users' requirements. Once this requirement level is established, IBM has one of the best records in satisfying these requirements.

● Exhibit III-23 shows that IBM users report one of the lowest dissatisfaction rates of all large-system users. In only 3 of the 10 categories listed in Exhibit III-23 are dissatisfaction rates higher than the norm, as shown in Exhibit II-2. Even for these three categories, overall user satisfaction is still very high.

● IBM continues to be one of the few mainframe manufacturers whose users report a dissatisfaction rate of less than 35% in the hardware maintenance service category (the norm is 48.8% dissatisfied). Considering the enormous installed base of IBM mainframes, the low levels of dissatisfaction indicates continued exceptional performance.

● Areas requiring increased attention include documentation and training. Forty-two percent of IBM users reported that they were dissatisfied with the documentation they received - up from 35.9% dissatisfied in 1983. Dissatisfaction with training increased from 35.9% in 1983 to 37% in 1984.

EXHIBIT III-22

USER SERVICE REQUIREMENTS VERSUS LEVEL OF SERVICE RECEIVED
VENDOR: IBM

TYPE OF SERVICE PROVIDED	AVERAGE LEVEL OF SERVICE			
	1984		1983	
	Required	Received	Required	Received
Planning	6.5	6.9	N/A	N/A
Consulting	6.2	6.7	6.0	6.7
Documentation	7.8	7.0	8.1	7.3
Training	6.9	6.8	7.5	6.7
Hardware Maintenance	9.0	8.6	9.3	8.6
Software Maintenance	7.2	7.0	8.3	6.7
Sales of Supplies	4.7	6.0	5.9	5.1
Add-On Sales	5.3	6.2	7.0	6.8
Site Audits	4.5	5.3	5.1	3.9
Relocation/Deinstallation	6.9	7.1	N/A	N/A

INPUT
FLS5

EXHIBIT III-23

USER SERVICE REQUIREMENTS SATISFACTION LEVEL
VENDOR: IBM

TYPE OF SERVICE	SATISFIED (User receives equal to or greater than required level of service) (Percent)	DISSATISFIED (User receives less than required level of service) (Percent)	NUMBER OF RESPONDENTS
Planning	70.2	29.8	47
Consulting	73.9	26.1	46
Documentation	58.0	42.0	50
Training	63.0	37.0	46
Hardware Maintenance	66.0	34.0	50
Software Maintenance	61.9	38.1	42
Sales of Supplies	86.8	13.2	38
Add-On Sales	75.6	24.4	41
Site Audits	76.9	23.1	39
Relocation/ Deinstallation	85.1	14.9	47

INP
FLS5

- Exhibit III-24 demonstrates how well IBM matches the level of service provided with the level of service required by the user. Only the sale of supplies, site audits, and add-on sales fall into the overkill area and yet many IBM users indicated that they prefer overcompensation in these areas.

J. NAS SERVICE PERFORMANCE

- Thirty-six NAS large-system (series AS5000-AS9XXX) users were interviewed in 1984, an increase of six over the 1983 survey.

- NAS users reported the highest overall level of service in the 1984 large-systems user requirements survey. As shown in Exhibit III-25, the level of service received improved dramatically in 9 of 10 service categories. Major improvements were made in:

  - Consulting.

  - Documentation.

  - Training.

  - Software maintenance.

- In 1983 users reported that the required level of service was not met in 12 of 13 categories. In 1984 service was equal to or better than required in 8 of the 10 categories. Hardware and software maintenance are the only categories in which service received did not exceed service required. Nevertheless, NAS users rated hardware maintenance received at 9.0 - the highest rating among large-system vendors.

INPUT

EXHIBIT III-24

USER SATISFACTION WITH SERVICE RECEIVED/REQUIRED
VENDOR: IBM
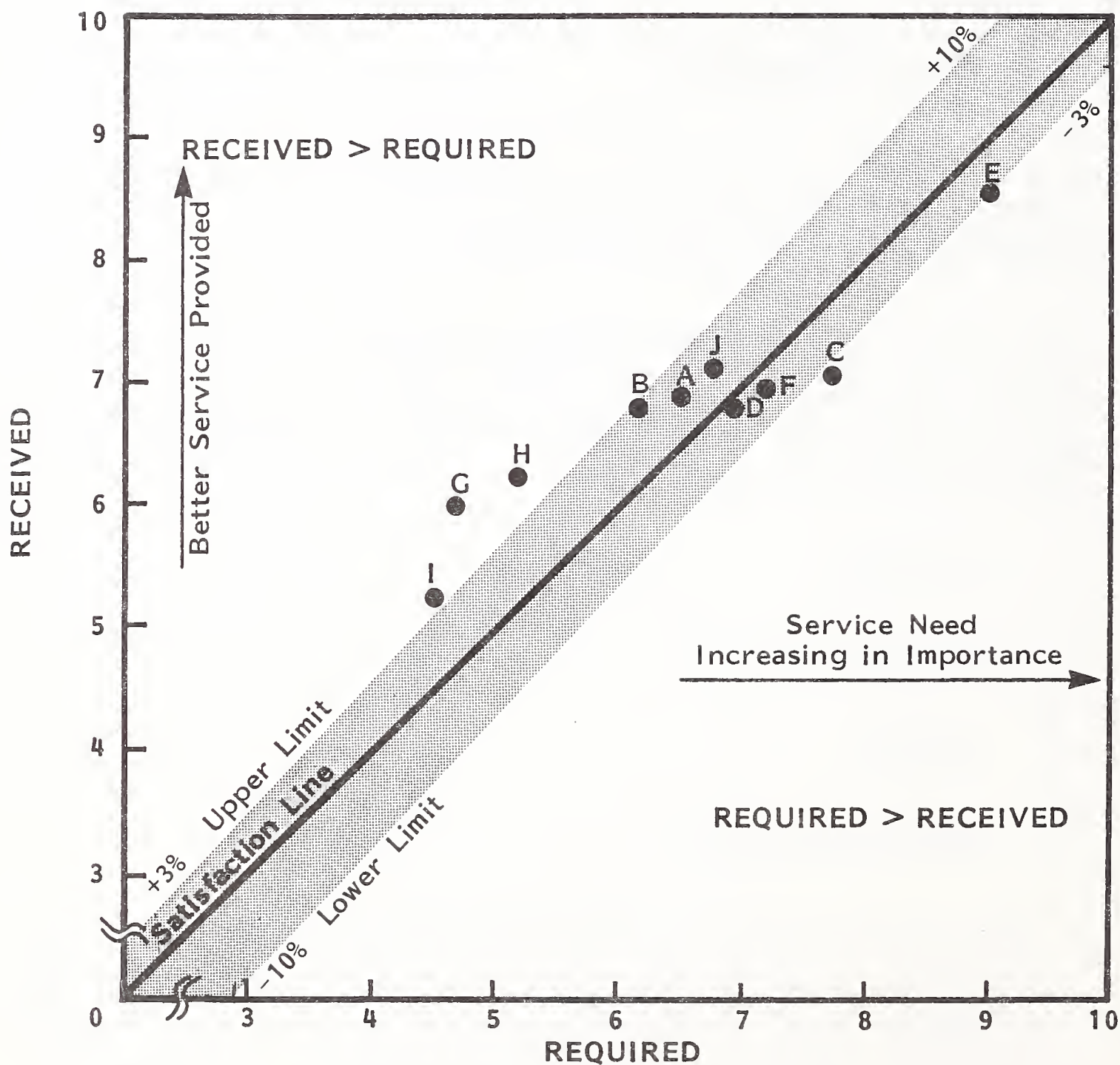
A = Planning
B = Consulting
C = Documentation
D = Training
E = Hardware Maintenance

F = Software Maintenance
G = Sale of Supplies
H = Add-On Sales
I = Site Audits
J = Relocation/Deinstallation

Rating: 1 = Low, 10 = High

INP

EXHIBIT III-25

USER SERVICE REQUIREMENTS VERSUS LEVEL OF SERVICE RECEIVED
VENDOR: NAS

TYPE OF SERVICE PROVIDED	AVERAGE LEVEL OF SERVICE			
	1984		1983	
	Required	Received	Required	Received
Planning	6.1	8.9	N/A	N/A
Consulting	5.8	8.1	5.5	5.3
Documentation	6.9	7.9	6.7	4.6
Training	6.4	8.2	6.3	4.6
Hardware Maintenance	9.3	9.0	9.2	8.7
Software Maintenance	8.2	8.1	6.6	5.4
Sales of Supplies	4.7	7.4	4.7	1.0
Add-On Sales	5.4	8.1	5.6	4.7
Site Audits	5.0	8.2	4.4	3.1
Relocation/Deinstallation	6.4	8.8	N/A	N/A

INPUT
FLS5

- Unsurprisingly, then, NAS users also evince high levels of satisfaction with service received, as shown in Exhibit III-26. Users were particularly satisfied with hardware maintenance; only 32.4% were dissatisfied with service in this area, the lowest rate of dissatisfaction among all the large-system vendors.

- Software maintenance is the only problem area that users identified. Almost 44% were dissatisfied with the software maintenance service received from NAS. This is essentially the same dissatisfaction rate as in 1983 and it is the only area where NAS falls below the average satisfaction rate for the industry.

- Exhibit III-27 graphically displays the high service performance ratings that were given NAS by its users. Given the fact that NAS is currently expanding into the area of single-source maintenance, much of the surplus service capacity can be applied to other vendors' equipment without seriously affecting NAS user satisfaction levels.

K.   UNIVAC SERVICE PERFORMANCE

- Fifty-two users of (Sperry) Univac 90/XX and 1100/XX large systems were interviewed in 1984, an increase of 20 interviews over last year's survey.

- Univac increased the level of service provided to the user in all 10 categories, yet the company still did not meet user expectations in four critical areas:

  - Documentation.

  - Training.

  - Hardware maintenance.

- 58 -

EXHIBIT III-26

USER SERVICE REQUIREMENTS SATISFACTION LEVEL
VENDOR: NAS

TYPE OF SERVICE	SATISFIED (User receives equal to or greater than required level of service) (Percent)	DISSATISFIED (User receives less than required level of service) (Percent)	NUMBER OF RESPONDENTS
Planning	92.9%	7.1%	28
Consulting	89.3	10.7	28
Documentation	74.2	25.8	31
Training	82.8	17.2	29
Hardware Maintenance	67.6	32.4	34
Software Maintenance	56.2	43.8	31
Sales of Supplies	84.2	15.8	19
Add-On Sales	91.3	8.7	23
Site Audits	89.5	10.5	19
Relocation/ Deinstallation	96.0	4.0	25

INPUT
FLS5

EXHIBIT III-27

USER SATISFACTION WITH SERVICE RECEIVED/REQUIRED
VENDOR: NAS
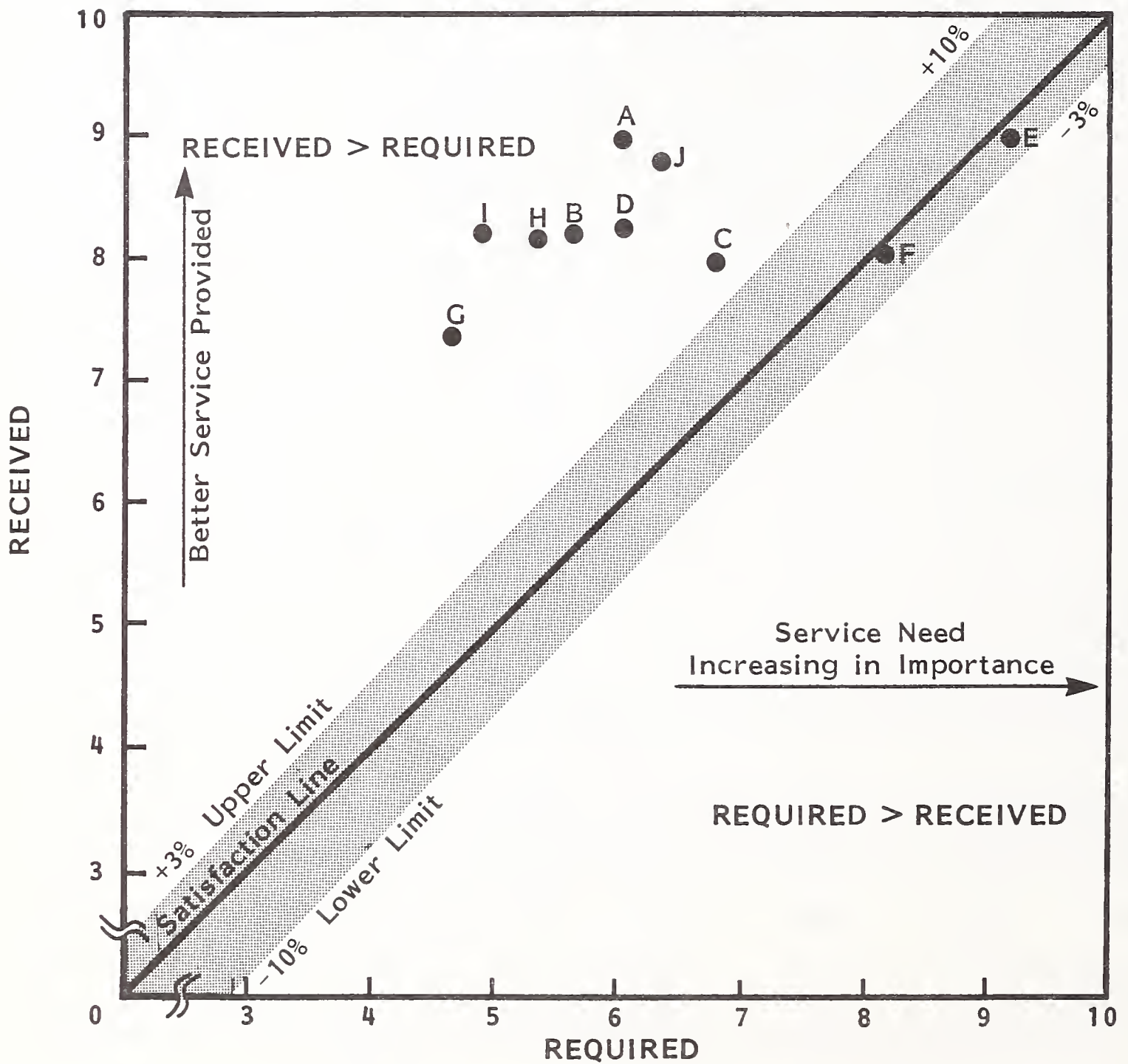
A = Planning   F = Software Maintenance
B = Consulting   G = Sale of Supplies
C = Documentation   H = Add-On Sales
D = Training   I = Site Audits
E = Hardware Maintenance J = Relocation/Deinstallation

Rating: 1 = Low, 10 = High

INP

-       Software maintenance.

- While Univac users required lower than average levels of service in 7 out of the 10 categories, Exhibit III-28 shows that users also receive less than the required level of service in the four key service categories: documentation, hardware maintenance, software maintenance, and training.

- It is therefore not surprising that user satisfaction levels are substantially below the norm, as shown in Exhibit III-29. For example, 59% of Univac users are dissatisfied with training services (compared to 36.5% for all large system users).

- The other post-sale service ratings are satisfactory. Users continue to rate planning above average, and substantial gains have been made in relocation/ reinstallation services, site audits, and add-on sales over the ratings achieved in 1983.

- It is in important service areas such as software and hardware maintenance, however, that improvements must be made. Dissatisfaction with these service categories has remained close to 50% since the 1983 survey and there are very few users who feel they are getting more service than they require.

- User dissatisfaction with training has actually increased from 45% in 1983 to 59% in 1984. Dissatisfaction with documentation remains more than 50% of all Univac users.

- Exhibit III-30 graphically shows the relationship between required versus received services. There is little overkill with regard to Univac services. Several Univac users indicated that the company should reprioritize the focus of its service resources to increase those allocated to hardware maintenance, even if that means curtailing some sales support functions.

- 61 -

INPUT

EXHIBIT III-28

USER SERVICE REQUIREMENTS VERSUS LEVEL OF SERVICE RECEIVED
VENDOR: UNIVAC

TYPE OF SERVICE PROVIDED	AVERAGE LEVEL OF SERVICE			
	1984		1983	
	Required	Received	Required	Received
Planning	6.4	7.3	N/A	N/A
Consulting	5.0	6.1	5.7	5.8
Documentation	7.1	6.4	6.9	5.6
Training	5.5	5.2	6.5	5.1
Hardware Maintenance	9.2	8.2	8.7	7.3
Software Maintenance	6.9	6.0	7.6	5.5
Sales of Supplies	4.2	5.2	5.4	3.1
Add-On Sales	5.1	6.5	5.7	5.8
Site Audits	4.1	4.9	4.8	3.6
Relocation/Deinstallation	5.7	6.6	N/A	N/A

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EXHIBIT III-29

- 63 -

USER SERVICE REQUIREMENTS SATISFACTION LEVEL
VENDOR: UNIVAC

TYPE OF SERVICE	SATISFIED (User receives equal to or greater than required level of service) (Percent)	DISSATISFIED (User receive less than required level of service) (Percent)	NUMBER OF RESPONDENTS
Planning	76.1%	23.9%	46
Consulting	70.0	30.0	40
Documentation	43.7	56.3	48
Training	41.0	59.0	39
Hardware Maintenance	51.9	48.1	52
Software Maintenance	52.3	47.7	44
Sales of Supplies	61.3	38.7	31
Add-On Sales	78.6	21.4	42
Site Audits	81.6	18.4	38
Relocation/ Deinstallation	89.7	10.3	39

INPUT
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EXHIBIT III-30

USER SATISFACTION WITH SERVICE RECEIVED/REQUIRED
VENDOR: UNIVAC
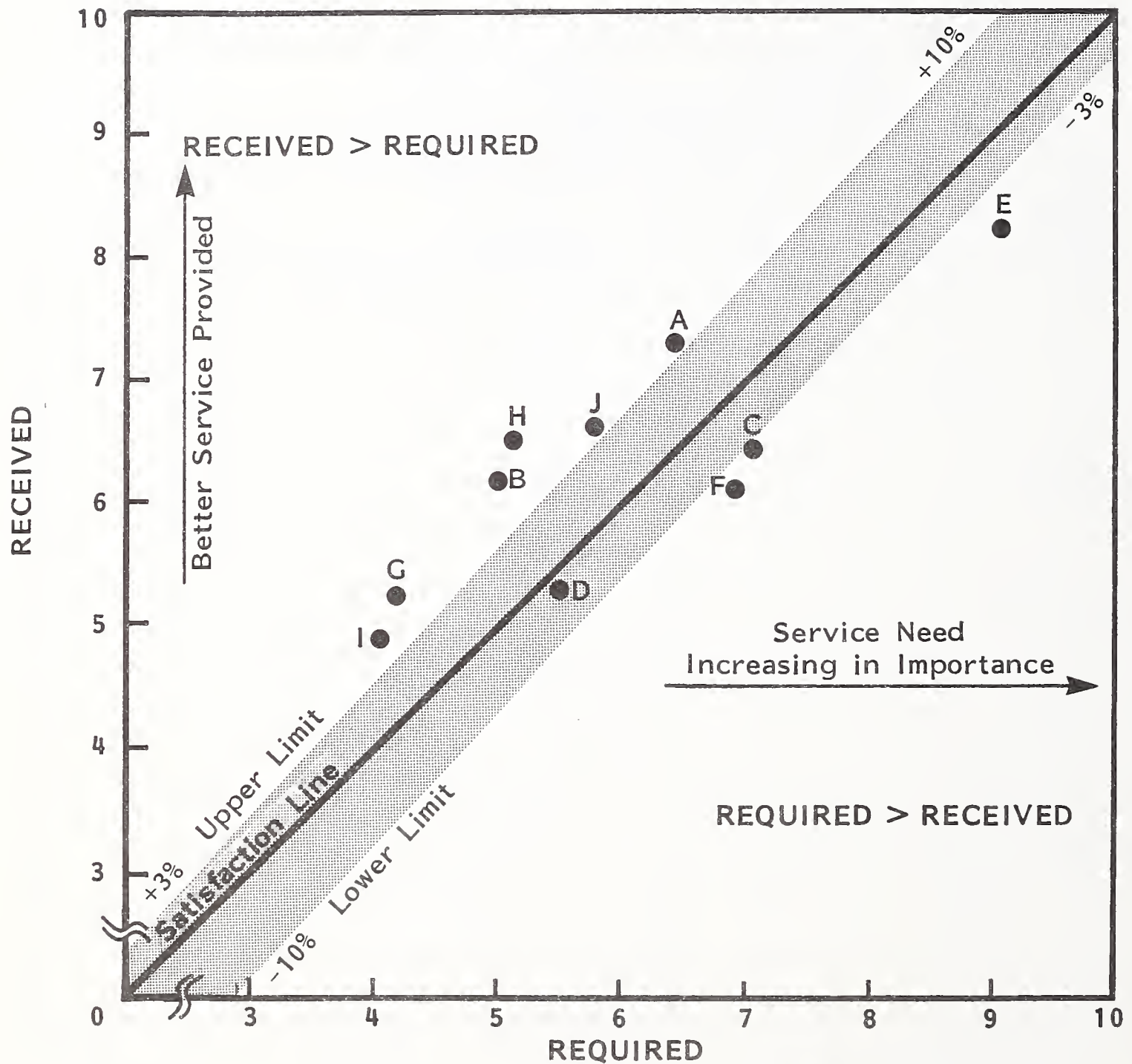
A = Planning   F = Software Maintenance
B = Consulting   G = Sale of Supplies
C = Documentation   H = Add-On Sales
D = Training   I = Site Audits
E = Hardware Maintenance   J = Relocation/Deinstallation

Rating: 1 = Low, 10 = High

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IV CUSTOMER SERVICE REQUIREMENTS

IV CUSTOMER SERVICE REQUIREMENTS

A.   INTRODUCTION

- Very early on in the interview process, INPUT found that each individual user had its own particular set of service requirements - and no set of requirements was exactly like any other. But regardless of service requirements, all the users had the same common objective: high system availability.

- System availability (sometimes called uptime) was consistently ranked as the most important feature of any service contract. This high emphasis on system availability was expected and is consistent with findings from last year's user requirements survey.

- It should be noted that system availability as defined by the user differs significantly from vendors' definitions. Users typically include recovery time in calculating availability, while vendors do not. The user definition of system availability is:

$$\frac{\text{Scheduled Use}}{\text{Actual Use} + \text{Downtime} + \text{Recovery Time}}$$

- The purpose of this chapter is to discuss overall requirements of system availability, as reported by the users of the 10 largest mainframe manufacturers. Various components of system availability, such as dispatching,

- 65 -

INPUT

response and repair time, and escalation, are also analyzed in this chapter. Finally, a number of alternatives designed to improve system availability will be discussed.

- Throughout the chapter, charts and graphs compare, when possible, 1983 and 1984 data. The <u>1983 Large-Scale System User Requirements</u> report contained responses from users of Tandem and Perkin-Elmer equipment. These vendors were not included in this year's large-system report, so the data has been adjusted to account for their removal from the 1983 data base. (Tandem and Perkin-Elmer are included in INPUT's <u>1984 Small-Scale System User Requirements</u> report).

B. SYSTEM AVAILABILITY

- As mentioned above, system availability is the one objective common to all large-system users. Invariably, price, reputation, and sometimes even system performance characteristics are considered secondary in importance to system availability.

- Exhibit IV-1 shows how users rated several maintenance factors in computer purchase decision making. Users overwhelmingly chose system availability as the most important factor. A large number of users reported that the only maintenance factor that would definitely prevent the purchase of equipment was low system availability.

- Exhibit IV-2 demonstrates the evolving demand for system availability between 1983 and 1984. Because of the importance of system availability, this success of the vendor in maintaining high system availability percentages is often an indicator of overall user satisfaction. However, since each vendor must satisfy his own particular user base, comparisons between vendors is neither effective nor accurate.

- 66 -

EXHIBIT IV-1

USER RATINGS OF MAINTENANCE FACTORS
IN COMPUTER PURCHASE DECISION MAKING

VENDOR	MAINTENANCE FACTORS (1-10)*			
	UPTIME/ SYSTEM AVAILABILITY	F.E. RESPONSE TIME	REPAIR TIME	VENDOR REPUTATION FOR SERVICE
All Vendors	9. 4	8. 7	8. 5	7.6
Amdahl	9. 3	8. 7	9. 0	8. 1
Burroughs	9. 6	8. 9	8. 4	7. 2
CDC	9. 4	8. 5	8. 5	6. 8
Cray	9. 2	9. 1	9. 3	7.2
DEC	9. 2	8. 5	8. 2	7.5
Data General	9. 4	8. 4	8. 4	8. 0
Honeywell	9. 4	8. 5	8. 3	7. 3
IBM	9. 5	8. 6	8. 4	8. 0
NAS	9. 6	9. 1	8. 9	8. 1
UNIVAC	9. 1	8. 3	7. 9	7.6

RATING: 1 = Low, 10 = High

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EXHIBIT IV-2

SYSTEM AVAILABILITY, 1983 AND 1984
USER REQUIREMENTS VERSUS VENDOR ACTUALS

VENDOR	MEAN 1984 (%)		MEAN 1983 (%)	
	REQUIRED	ACTUAL	REQUIRED	ACTUAL
All Vendors	96.5	96.7	96.8*	97.0*
Amdahl	97.8	98.0	97.7	97.9
Burroughs	97.5	98.3	97.9	98.2
CDC	96.4	95.7	95.8	95.2
Cray	95.4	95.4	96.4	96.9
DEC	93.1	95.8	96.3	96.6
Data General	96.3	94.5	92.3	95.0
Honeywell	97.3	97.6	97.6	96.8
IBM	97.6	97.1	97.7	97.7
NAS	97.8	98.5	97.9	97.9
Univac	95.7	95.9	96.6	97.3

* Adjusted to compensate for the removal of Perkin Elmer and Tandem from last year's data.

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- In 1984, six of the large system vendors exceeded their users' requirements for availability. These vendors include:

  - Amdahl.

  - Burroughs.

  - DEC.

  - Honeywell.

  - NAS.

  - Univac.

- Growing discrepancies between service required and service received from 1983 to 1984 are noteworthy. Requirements for Data General availability, for example, grew dramatically from 92.3% in 1983 to 96.3 in 1984. When applied to the very large DG user vase, this represents a significantly increased workload for DG's customer services division. Availability requirements also increased at Amdahl, DG, and CDC.

- Large system users typically require 97% $\pm$ 1% for overall system availability. This general requirement has remained virtually unchanged over the past two years. In addition, many users also report that there are critical processing times when 100% availability is essential.

- Users are particularly skeptical about vendors' guarantees of specific levels of availability. The users INPUT interviewed typically have long experience in operating and managing large systems, and believe that such guarantees cannot be supported by the vendor. Despite this skepticism, however, there is a substantial latent demand for a supportable guarantee of very high levels (99+%) of system availability.

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- Vendors should note, however, that if uptime guarantees are offered and then not met, ensuing dissatisfaction among users can result in an erosion of the customer base.

- The average number of unscheduled system interruptions each month (reported by the users INPUT surveyed) is listed in Exhibit IV-3. When compared to the system availability figures in Exhibit IV-2, these data lead to some interesting conclusions:

  - A low number of system interruptions does not necessarily correspond to high system availability (which some vendors have a tendency to assume).

  - A large number of system interruptions each month has a significant impact on user satisfaction, irrespective of its impact or actual system availability.

  - System interruptions caused by software problems typically take longer to resolve, result in lower system availability, and create high dissatisfaction levels.

- Exhibit IV-3 indicates that users experience a wide range of system interruptions each month, but it is the duration of the interruptions and not necessarily their number that affects system availability. For example, Amdahl has 30% more system interruptions each month than DEC, and yet Amdahl has a substantially higher system availability rate. Burroughs, with one of the highest system availability rates, has the fourth highest number of system interruptions per month.

- The duration of system interruptions greatly affects system availability and hence user satisfaction. IBM, for example, is eighth in number of interruptions (5.5/month) and yet third in satisfaction with hardware and

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EXHIBIT IV-3

AVERAGE NUMBER OF HARDWARE AND SOFTWARE SYSTEM
INTERRUPTIONS PER MONTH

VENDOR	Number of Interruptions per Month	CAUSE		
		Hardware Problem (Percent)	Software Problem (Percent)	Other (Percent)
All Vendors	3.6	63.2%	25.3%	11.5%
Amdahl	3.7	70.7	28.5	.8
Burroughs	3.4	79.8	13.0	7.2
CDC	5.7	65.0	24.5	10.5
Cray	6.0	63.3	36.7	-
DEC	2.3	69.0	20.5	10.5
Data General	2.8	56.7	32.8	10.5
Honeywell	2.6	63.4	24.6	12.0
IBM	5.5	52.9	41.6	5.5
NAS	2.2	33.2	23.6	43.2
Univac	3.4	76.1	17.1	6.8

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software service. Data General, in the other hand, has a low number of system interruptions (2.8/month), but rates low in user satisfaction because of the above-average duration of the interruptions.

- Most of the users interviewed by INPUT indicated that software problems took longer to solve than hardware problems. Consequently, the percent of software problems listed in Exhibit IV-3 can be a significant indicator of user satisfaction. For example:

    - Data General's low system availability figures can be explained, in part, by a high percentage of software problems, and a below average of MTTR for software-related failures.

    - Burroughs has the smallest number of software problems, and ranks very high in system availability.

- IBM is the exception that proves the rule. IBM had the highest percentage of software-related problems, but the lowest MTTR for software problems. Because software interruptions were corrected quickly, IBM was able to achieve a high level of system availability.

- It is important to recognize that it is not software problems per se that increase downtime, but rather the inability of the average vendor to diagnose and repair software expeditiously. This inability, combined with the fact that software repairs are often done at remote locations, results in lower system availability and higher levels of user dissatisfaction.

- Users' ratings of vendors' responsiveness are shown in Exhibit IV-4. INPUT has found that the overwhelming majority of users believe that the FE at their site is well trained and skilled at repairing equipment. (Only 17% of the large-system users said hardware training of FEs is the most important change vendors could make to improve service). Many users, however, emphasized that the response time of the FE and the service organization in general critically affects the effectiveness of their own operations.

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EXHIBIT IV-4

- 73 -

USER RATINGS OF VENDOR RESPONSIVENESS

VENDOR	1984 MEAN (1-10)	1983 MEAN (1-10)	1983-1984 PERCENT INCREASE (DECREASE)
All Vendors	7.9	8.0*	(1.2%)
Amdahl	8.9	8.8	1.1
Burroughs	7.8	6.9	13.0
CDC	7.8	7.8	-
Cray	8.3	9.0	(7.8)
DEC	7.6	7.8	(2.6)
Data General	7.6	7.6	-
Honeywell	7.3	7.6	(3.9)
IBM	8.3	8.2	(1.2)
NAS	8.9	8.3	7.2
UNIVAC	7.5	7.9	(5.0)

*Adjusted to compensate for the removal of Perkin Elmer and Tandem from last year's data.

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- Amdahl, Cray, IBM, and NAS have the best ratings for general responsiveness among the 10 largest mainframe vendors. Nevertheless, most users see a decline in general responsiveness. A number of DEC users, for example, felt that responsiveness was declining due to the increase in the company's business - an increase that some users felt DEC was unable to support adequately.

- Burroughs users, on the other hand, cited increased corporate support for the service function and increased their ratings of Burroughs responsiveness by over 12%.

C.   HARDWARE SERVICE REQUIREMENTS

- Exhibit IV-5 lists hardware response time requirements, along with actual performance for each of the 10 large-system vendors. The reader should be aware that these and other requirements listed in this report are not contractual requirements, but rather what the users require for optimal system performance.

- Interestingly, Exhibit IV-5 reveals that most users require and receive hardware response rates substantially lower than the standard two-hour contractual limit. Of the 10 vendors listed, five provide faster hardware response than is actually required.

- The average hardware response time requirement has decreased from 1.6 hours in 1983 to 1.7 hours in 1984. The average response time received by users has increased substantially from 1.3 hours in 1983 to 1.8 hours in 1984. Only one vendor improved actual hardware response time in 1984 (Data General, which improved response time by 8.7%); Honeywell maintained the 1983 level of response.

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EXHIBIT IV-5

HARDWARE RESPONSE TIME – USER REQUIREMENTS
VERSUS VENDOR ACTUALS

VENDOR	MEAN 1984 (Hours)		MEAN 1983 (Hours)	
	REQUIRED	ACTUAL	REQUIRED	ACTUAL
All Vendors	1.7	1.8	1.6*	1.3*
Amdahl	1.5	1.0	1.4	1.0
Burroughs	1.1	2.0	1.1	0.8
CDC	2.4	2.0	1.4	0.9
Cray	1.0	0.6	0.7	0.6
DEC	2.7	3.4	2.2	1.8
Data General	2.5	2.1	3.0	2.3
Honeywell	1.4	1.4	1.5	1.4
IBM	1.5	1.8	1.2	0.7
NAS	1.4	1.1	1.2	0.8
Univac	1.4	1.4	1.3	1.2

* Adjusted to compensate for the removal of Perkin Elmer and Tandem from last year's data.

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- Vendors whose response time deteriorated for the sample interviewed include:

    - Burroughs: actual response time increased by 150%.

    - CDC: actual response time increased by 122%.

    - DEC: actual response time increased by 89%.

    - IBM: actual response time increased by 157%.

    - NAS: actual response time increased by 38%.

    - Univac: actual response time increased by 17%.

- Hardware response time performance is affected by dispatching, parts availability, and escalation, all of which are discussed later in this chapter.

- While the average hardware response time has increased for most large-system vendors, actual repair time has fallen. Exhibits IV-6 lists user requirements for hardware repair time in 1984, as well as the actual vendor performance in 1983 and 1984.

- In 1984, eight of the ten vendors listed in Exhibit IV-6 improved repair time averages over 1983. CDC and Burroughs were the only vendors that did not.

- Several vendors improved repair time substantially:

    - Data General: 57% improvement in hardware repair time.

    - DEC: 26% improvement in hardware repair time.

    - IBM: 16% improvement in hardware repair time.

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EXHIBIT IV-6

USER REQUIREMENTS: MEAN TIME TO REPAIR
VERSUS VENDOR ACTUALS

VENDOR	MEAN TIME (HOURS)		
	REQUIRED 1984	ACTUAL 1984	ACTUAL 1983
All Vendors	2.6	2.6	3.0*
Amdahl	2.3	1.7	1.8
Burroughs	2.6	4.5	3.7
CDC	3.8	3.1	2.2
Cray	1.3	0.9	1.1
DEC	3.7	3.4	4.'6
Data General	2.4	2.5	5.8
Honeywell	3.3	2.8	3.1
IBM	2.6	2.1	2.5
NAS	2.0	1.5	1.9
UNIVAC	2.0	2.4	2.9

* Adjusted to compensate for the removal of Perkin Elmer and Tandem from last year's data.

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- Seven of the 10 vendors listed in Exhibit IV-6 exceeded user requirements for hardware repair time. Users were typically more forgiving when it came to repair time because 1) they believe the FE is doing the best possible job, and 2) they recognize the limitations of parts availability. Yet when repair time is very high, users tend to question the competence of the FE and the quality of the computer itself.

- Exhibit IV-7 graphically displays user perceptions of total mean time to repair (MTTR) for hardware. It is important to note that many users define MTTR as the total downtime, including both response time and repair time. Their definition will therefore not correspond to the vendor definition of MTTR, which typically separates mean time to respond from mean time to repair.

- Users report that a majority of large system vendors have exceeded their requirements for MTTR. Only Burroughs, DEC, and Univac failed to satisfy users' requirements in this area. Univac fell behind primarily because of repair delays, while DEC and Burroughs primarily failed to meet user requirements because of response delays.

- The best performance in this area is achieved by those vendors that most closely match actual service with user requirements - that is, neither fail to meet user needs nor overly exceed them. A good guideline is to beat the user requirement by no more than 10%.

- Vendors with the best MTTR according to this criteria include:

  - IBM: actual MTTR of 5% better than required.

  - Data General: actual MTTR of 6% better than required.

  - Honeywell: actual MTTR of 9% better than required.

- 78 -

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EXHIBIT IV-7

HARDWARE TOTAL* REPAIR TIME:

USER REQUIREMENTS VERSUS VENDOR ACTUALS

Legend:
☐ = User Requirement   ▨ = Vendor Actual

*Repair Time, as defined by user = Response Time + Repair Time

Y-axis: Repair Time* (Hours)

Categories: Amdahl, Burroughs, CDC, Cray, DEC, Data General, Honeywell, IBM, NAS, UNIVAC

Values:
- Amdahl: 3.8, 2.6
- Burroughs: 3.7, 6.6
- CDC: 6.1, 5.1
- Cray: 2.2, 1.5
- DEC: 6.5, 6.8
- Data General: 4.9, 4.6
- Honeywell: 4.7, 4.3
- IBM: 4.1, 3.9
- NAS: 3.4, 2.6
- UNIVAC: 3.4, 3.8

INPUT
FLS5

- The average user requirement for mean time to repair hardware for all vendors is 4.3 hours. The average vendor actual MTTR is 4.4 hours.

D. SOFTWARE SERVICE REQUIREMENTS

- User requirements for software support are increasing at a rapid rate and large-system vendors are prepared to meet these requirements. Users have reacted favorably to software hotline support, increased remote diagnostics/repair software, and improved software training for the on-site FE. Exhibits IV-8, IV-9, and IV-10 show, however, that vendors must continue to increase software support.

- Exhibit IV-8 lists user requirements for software response time and the average time it takes large-system vendors to actually respond. (Software response is defined as a telephone call or on-site visit to correct the software problem.) As the exhibit indicates, there is a wide variation in both response time requirements and actuals.

- Five of the vendors in Exhibit IV-8 essentially meet or exceed user requirements for software response time. It is interesting that some of the most stringent user requirements (2.4 hours for Amdahl users, 4.2 hours for Honeywell users) are exceeded, while much lower expectations (16.1 hours for DEC, 9.7 hours for Univac) are not met.

- Many users differentiated between response time requirements for serious software problems and chronic, yet minor, problems. Typically, users had little or no response or repair requirements for minor problems; i.e., they were willing to postpone repairs until the next release of the software. Serious problems, however, required rapid response, and for system shutdowns attributable to software problems, users required the same response as for a serious hardware problem. Exhibits IV-8, IV-9, and IV-10 list responses for serious and critical software problems.

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EXHIBIT IV-8

SOFTWARE RESPONSE TIME: USER REQUIREMENTS
VERSUS VENDOR ACTUALS

VENDOR	MEAN TIME (HOURS)	
	REQUIRED	ACTUAL
All Vendors	11.5	13.8
Amdahl	2.4	2.2
Burroughs	9.6	6.6
CDC	7.3	9.7
Cray	8.7	9.5
DEC	16.1	27.9
Data General	25.5	11.5
Honeywell	4.2	3.7
IBM	4.7	4.7
NAS	9.4	12.3
UNIVAC	9.7	15.7

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EXHIBIT IV-9

SOFTWARE REPAIR TIME: USER REQUIREMENTS
VERSUS VENDOR ACTUALS

VENDOR	MEAN TIME (HOURS)	
	REQUIRED	ACTUAL
All Vendors	23.7	34.5
Amdahl	5.2	3.2
Burroughs	34.4	42.9
CDC	25.2	27.6
Cray	8.8	18.5
DEC	23.4	50.4
Data General	27.0	49.3
Honeywell	16.2	23.9
IBM	10.7	9.3
NAS	21.7	28.6
UNIVAC	33.4	47.9

EXHIBIT IV-10

SOFTWARE TOTAL* REPAIR TIME:
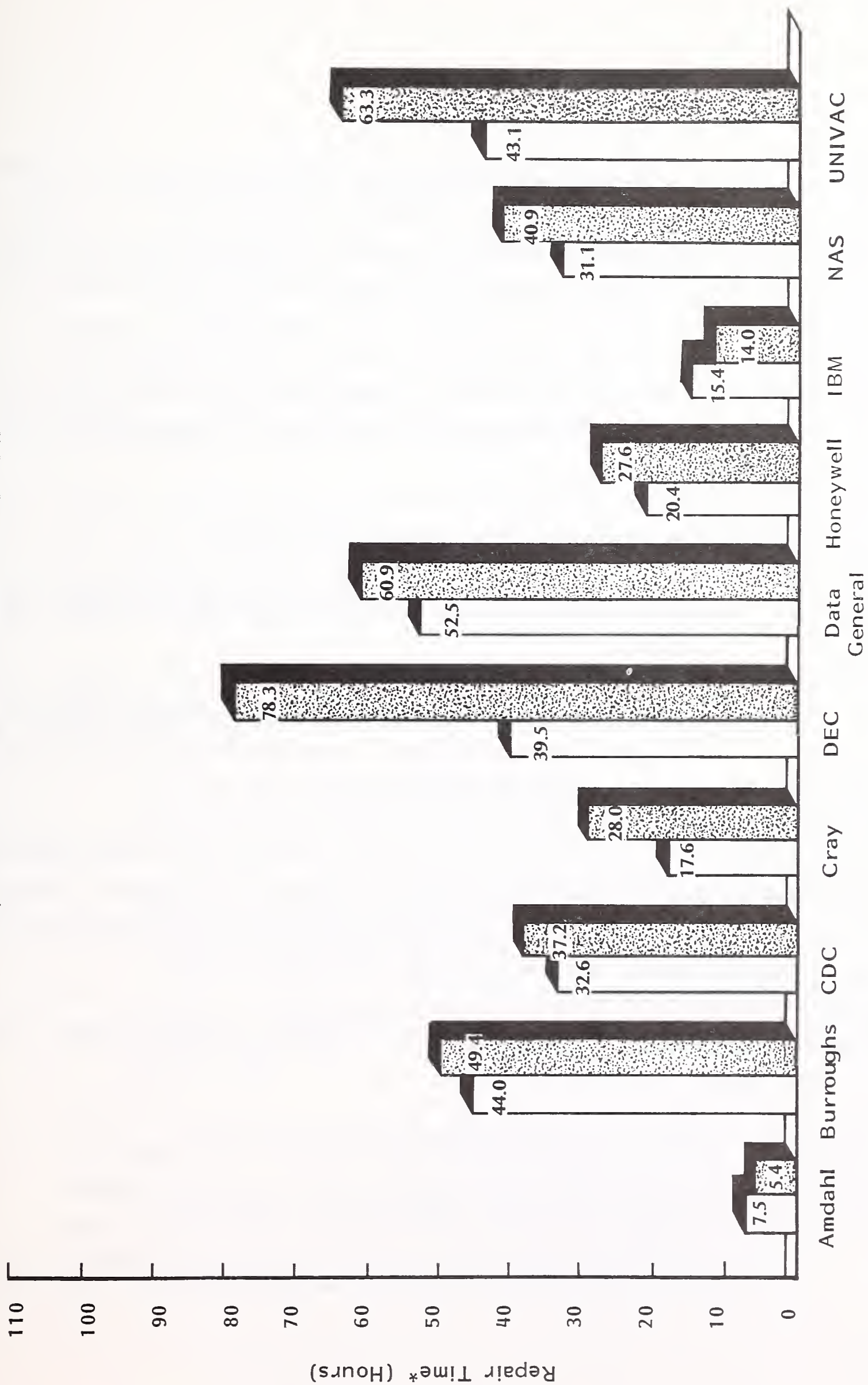
USER REQUIREMENTS VERSUS VENDOR ACTUALS

Repair Time* (Hours)

Amdahl Burroughs CDC Cray DEC Data General Honeywell IBM NAS UNIVAC

☐ = User Requirement   ▨ = Vendor Actual

*Repair Time, as defined by user = Response Time + Repair Time

- 83 -

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- Exhibit IV-9 lists user requirements for software repair time. Only two of the vendors in this exhibit (IBM and AMDAHL) actually perform better than the users require. Response times of the other vendors range from an average of two hours in excess of user's requirements to 27 hours beyond user requirements.

- Exhibit IV-10 lists the mean time to repair for software. As in the hardware section (above), repair time is defined as the sum of response time and repair time.

- Exhibit IV-10 graphically depicts two important facts:

  - The vast majority of users are receiving less software support than is required.

  - Repair times are typically much longer for software problems than they are for hardware problems - even when the problems result in the same impact on systems availability.

- Users reported that only two of the top 10 large system vendors (IBM and Amdahl) are exceeding their support requirements for software. In fact, of the users who responded, almost 25% said better software support was the most important improvement vendors could make in service.

- Several vendors must concentrate on improving software support. These include:

  - DEC: repair time is 98% below user requirements.

  - Univac: repair time is 47% below user requirements.

  - Honeywell: repair time is 35% below user requirements.

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- NAS: repair time is 31% below user requirements.

- Comparisons of repair time with regard to hardware and software problems are revealing. For example, Univac and Data General users reported that hardware response/repair time was over 10 times faster than software response/repair time. Amdahl users reported the best software repair time among the top 10 large-system vendors, and yet even these users said response/repair time was twice as fast for hardware than for software.

- Vendors must recognize that low levels of software support will ultimately have a serious effect on the user base. Comments such as "I don't even bother to call anymore" and "That hotline staff really needs more training" were common and express the frustration users are feeling in this area.

- Software support seems to suffer from several problems that are not common in hardware support:

  - More and more software support is coming from remote locations. The user cannot see tangible evidence that the problem is being worked on.

  - There is no equivalent to board swapping for software problems; i.e., problems must be dealt with individually.

  - The current undersupply of software engineers (compared to hardware engineers) means that trained staff are not always available to respond to user needs.

- User requirements for improved software support are likely to increase substantially in the next two to three years. Ultimately, users will expect equally high levels of hardware and software support as they concentrate more on system availability than on causes of system failure.

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E. DISPATCHING AND ESCALATION PROCEDURES

- User ratings of large-system vendors' dispatching procedures are shown in Exhibit IV-11. Most of the vendors in this report have implemented automated dispatching systems at the regional or national level, so it was surprising to see user ratings fall from an average of 8.0 in 1983 to 7.6 in 1984.

- Of the top 10 large system vendors, only three received equal or improved 1984 ratings of their dispatching procedures over their 1983 ratings. These companies include Amdahl, CDC, and DEC.

- As Exhibit IV-11 shows, several companies suffered a significant ratings loss in dispatching. For example, users rated Cray 12% lower in 1984 than in 1983; Univac's rating was 7.6% lower and Honeywell's 6.7% lower.

- Users attributed the lower ratings to several causes:

  - The removal of local and even regional dispatch centers. Users expressed frustration at not having more control over the dispatching process.

  - Users are being forced to rely more and more on remote software support. Since software problems tend to take longer to solve, users assume that poor dispatching procedures contributed to the delay.

- Exhibit IV-12 lists the users' ratings of escalation procedures. As with dispatching, users have been very critical of the vendor performance in escalating service problems. Only one of the top 10 vendors (CDC) improved its user ratings of escalation procedures.

- Three of the large system vendors registered critical drops in user ratings of escalation procedures. Data General dropped 26%, Cray 21%, and Univac 14%.

INPUT

EXHIBIT IV-11

USER RATINGS OF HOW WELL VENDORS HANDLE DISPATCHING

VENDOR	1984 MEAN (1-10)	1983 MEAN (1-10)	1983-1984 PERCENT INCREASE (DECREASE)
All Vendors	7.6	8.0*	(5.0)*
Amdahl	8.4	8.4	–
Burroughs	7.5	7.6	(1.3)
CDC	7.6	7.5	1.3
Cray	8.0	9.1	(12.1)
DEC	7.9	7.8	1.3
Data General	7.4	7.7	(3.9)
Honeywell	7.0	7.5	(6.7)
IBM	7.8	8.2	(6.1)
NAS	8.3	8.6	(3.5)
UNIVAC	7.3	7.9	(7.6)

*Adjusted to compensate for the removal of Perkin Elmer and Tandem from last year's data.

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EXHIBIT IV-12

USER RATINGS OF VENDORS' ESCALATION PROCEDURES

VENDOR	1984 MEAN (1-10)	1983 MEAN (1-10)	1983-1984 PERCENT INCREASE (DECREASE)
All Vendors	7.0	7.6 *	(7.9)*
Amdahl	7.8	8.2	(4.9)
Burroughs	6.5	6.9	(5.8)
CDC	7.0	6.8	2.9
Cray	7.0	8.9	(21.3)
DEC	7.3	7.3	–
Data General	5.9	8.0	(26.3)
Honeywell	6.4	6.7	(4.5)
IBM	7.8	7.9	(1.3)
NAS	8.1	8.5	(4.7)
UNIVAC	6.4	7.5	(14.7)

*Adjusted to compensate for the removal of Perkin Elmer and Tandem from last year's data.

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- While most users expressed complete satisfaction with the technical competence, a significant number (30-35%) felt that qualified FEs were too few and far between. One user, for example, commented that his FE had done excellent work on an older machine at the site, but was not qualified to work on a newly installed machine. "I'm paying for his training," the user said.

- It should be emphasized that users are not necessarily complaining about the FEs, but rather about the lack of escalation procedures to assist the engineer. Most users recognize the trend away from on-site subcomponent diagnosis and repair, but at the same time they reject board swapping as a satisfactory method of meeting their service needs. They see well-defined escalation procedures as necessary to maintain high levels of system availability. Exhibit IV-12 indicates that users feel these requirements are not being met.

F.   FIELD ENGINEER COMMUNICATION

- The quality and level of communication between the user and the hardware/software engineer is an important factor in user satisfaction. Users view the field engineer as the company's on-site representative, responsible not only for repairs, but also for consulting, clarifying policies, and providing advice about equipment.

- IBM has traditionally been considered a leader in advancing the concept of a customer engineer, i.e., an FE responsible for assisting the customer in a variety of nontraditional ways. IBM's investment in the nontechnical side of service pays substantial dividends in terms of both increased customer demands for other services (e.g., consulting, training, supplies) as well as in greater overall user satisfaction.

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- Improving the ability of the FE to communicate with the user is clearly a goal of some, but not all, of the vendors. As shown in Exhibit IV-13, NAS, Amdahl, and Cray all have effective programs for promoting the hardware engineer's communication (Cray users continue to rate the FEs' communication level high (8.4), but they reported a drop in actual performance in 1984). IBM, Univac, and DEC also met or beat an 8.0 rating.

- In many cases, users reporting low levels of communication also said their FEs were overworked and could not take the time to answer questions and explain problems. This feeling was very common among Honeywell and Univac users, for example. Some vendors appear to be trying to reduce labor force expenditures by stretching their FEs too thinly. In doing so, these vendors actually risk long-term revenue losses as dissatisfied users seek other service alternatives.

- Exhibit IV-14 rates software FEs according to their ability to communicate with users. These ratings are significantly lower than for hardware engineers, primarily due to the lack of personal interaction between the software FE and the user. A secondary factor is the typically poor software response time most users receive (see above).

- While there are explanations as to why users give low communication ratings to software FEs, it does not correct what users see as a very serious problem. Only one of the top 10 large-system vendors (NAS) scored above 8 in Exhibit IV-14.

G. ALTERNATIVE METHODS OF MAINTENANCE

- Exhibit IV-15 lists user attitudes toward alternative delivery methods for maintenance. The responses in this exhibit are significant because they indicate that there is a substantial submarket of large-system users who are

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EXHIBIT IV-13

- 91 -

USER RATINGS OF HARDWARE FIELD SERVICES ENGINEERS' COMMUNICATION

VENDOR	1984 MEAN (1-10)	1983 MEAN (1-10)	1983-1984 PERCENT INCREASE (DECREASE)
All Vendors	8.0	8.1*	(1.2%)*
Amdahl	8.5	8.5	-
Burroughs	7.8	7.8	-
CDC	7.7	7.8	(1.3)
Cray	8.4	8.9	(5.6)
DEC	8.0	7.9	1.3
Data General	7.6	8.0	(5.0)
Honeywell	7.4	8.0	(7.5)
IBM	8.2	8.1	1.2
NAS	8.9	8.6	3.5
UNIVAC	8.1	8.3	(2.4)

*Adjusted to compensate for the removal of Perkin Elmer and Tandem from last year's data.

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EXHIBIT IV-14

USER RATINGS OF SOFTWARE FIELD SERVICE ENGINEERS' COMMUNICATION

VENDOR	1984 MEAN (1-10)	1983 MEAN (1-10)	1983-1984 PERCENT INCREASE (DECREASE)
All Vendors	6.8	6.9 *	(1.4%)*
Amdahl	7.4	7.9	(6.3)
Burroughs	6.9	6.5	6.2
CDC	5.8	6.0	(3.3)
Cray	6.0	8.2	(26.8)
DEC	6.1	5.6	8.9
Data General	6.8	6.9	(1.4)
Honeywell	6.8	6.6	3.0
IBM	7.2	7.1	1.4
NAS	8.1	7.5	8.0
UNIVAC	6.2	6.6	6.1

*Adjusted to compensate for the removal of Perkin Elmer and Tandem from last year's data.

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EXHIBIT IV-15

USER ATTITUDES TOWARD

ALTERNATIVE DELIVERY METHODS FOR MAINTENANCE

(Assumes Appropriate Premium or Discount)

MAINTENANCE DELIVERY METHOD	RATING (1-10)			
	HARDWARE		SOFTWARE	
	1984 MEAN	1983 MEAN	1984 MEAN	1983 MEAN
Traditional On-Site Response to Trouble Calls	8.4	8.6	7.3	7.4
User Involvement in Diagnosis Using Support Centers, no Remote Diagnostics	6.3	6.0	6.7	6.4
User Involvement in Diagnosis With Remote Diagnostics	5.7	6.5	5.7	7.0
User Involvement Replacing Boards or Patching Software	4.8	4.3	5.8	5.5
User Delivering Modules to Repair Centers	3.5	4.2	3.6	3.9
Consulting/ Software Customization	N/A	N/A	5.5	N/A

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willing to perform some of their own maintenance in order to improve system availability and/or lower the price of service.

- While users clearly see the advantage of doing some of their own maintenance, they are very restrictive about what they will do. User delivery of modules to repair centers is not considered a viable option, as indicated by the user ratings in Exhibit IV-15. Even when transportable items such as terminals or circuit boards were considered, there was basically a negative reaction by users. Typically, lack of personnel was cited as the reason why this option was unacceptable.

- There is also a declining interest in user involvement in remote diagnostics, perhaps because users consider remote diagnostics a vendor-induced service function. If this is the case, vendors would be well advised to encourage greater user tolerance of remote diagnostics - at least until these methods become more reliable.

- User interest in and acceptance of involvement in both hardware and software diagnostics has been growing (this does not include remote diagnostics). One reason for this is that users want to know more about the problems occurring with their machines. It is interesting to note that users are increasingly more willing to become involved in software diagnostics than hardware diagnostics. Users interviewed explained that greater understanding of software diagnostics was necessary to compensate for poor software engineer communication.

- The other maintenance delivery method that is gaining acceptance is user involvement in replacing circuit boards and/or patching software. User interest in this alternative depends on the availability of qualified in-house staff. As Exhibit IV-15 shows, users seem to be hiring more hardware and software staff (particularly software) who are capable of performing minor patches/repairs.

- Overall, large system users continue to prefer the traditional method of maintenance - on-site vendor response for both hardware and software problems. Users are, however, much more willing to become involved in software problems than hardware problems, because users frequently perceive software support as inadequate. Most users indicated that as long as service was considered acceptable, their preference was not to be involved. When service deteriorated, however, users agreed to participate in order to maintain high levels of system availability and, secondarily, to reduce service prices.

- An interesting possibility that service vendors must consider is the potential of competition from the users themselves if they become skilled in diagnostics and repair. However, in the absence of other alternatives this does appear to be a good way for the vendors to improve their users' satisfaction with service without major increases in service staff.

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V THIRD-PARTY MAINTENANCE/SINGLE-SOURCE MAINTENANCE

V THIRD-PARTY MAINTENANCE/SINGLE-SOURCE MAINTENANCE

A. INTRODUCTION

- The demand for third-party maintenance (TPM) has been growing rapidly in the last 10 years and INPUT projects this growth will continue. The market, which is already over $500 million a year, is projected to exceed $1 billion by 1987. The demand for TPM is fueled primarily by two distinct types of products:

    - Obsolete equipment.

    - Equipment that the original manufacturers cannot, for various reasons, support.

- Obsolete equipment, such as the IBM 370 or 360 series, is a traditional source of revenue for TPM vendors. Although OEM service is still available for most of these products, TPM vendors provide a valuable service by coordinating parts availability and upgrading the machines with state-of-the-art equipment.

- Because respondents of this survey were selected on the basis of their use of current CPUs, less than 2% of the respondents indicated they used third-party maintenance on their obsolete CPUs. A much larger group, however, indicated they used TPM for peripherals.

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- A much larger percentage of users indicated that they were using TPM vendors for peripheral devices. This is to be expected, considering the number of small peripheral equipment manufacturers that have recently entered the marketplace. These manufacturers typically lack the resources to maintain nationwide service networks and therefore must depend on TPM vendors to service their equipment.

B.   THIRD-PARTY MAINTENANCE

- It has been assumed by both users and service vendors that pricing is a major factor in user selection of service. While service pricing is important to users (see Chapter VI) respondents to this survey indicated that in choosing third-party maintenance, price was not nearly as important as the quality of service.

- Exhibit V-I rates service features considered most important by users who have considered or who are currently using third-party maintenance. Features that affect the quality of service (e.g., hardware support, accessibility) are considered much more important to users than low price.

- These results are consistent with user requirements for OEM service and reflect the increasing emphasis users are placing on quality and responsiveness of service. Users are becoming increasingly dependent on all levels of DP equipment, not just the CPU. One user, for example, indicated that his three line printers are used continuously during the last three days of each month. Failure of any one of these printers during this period would be "disastrous," he said. In situations such as these, price of service is not a high priority.

- Interestingly, many users indicated that parts availability was a very important feature of TPM vendor service - even though this was not a feature vendors were initially asked about. Parts availability was particularly impor-

- 98 -

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EXHIBIT V-1

USER RATINGS OF IMPORTANCE OF THIRD-PARTY
MAINTENANCE FEATURES

FEATURE	RATING (1 – 10)	STANDARD DEVIATION	NUMBER OF RESPONSES
Price of Third-Party Maintenance	7.7	2.1	181
Improved Response Time	8.0	2.0	181
Third-Party Vendor Reputation	8.1	1.9	181
Hardware Support Provided by Third-Party Vendor	8.5	1.9	180
Software Support Provided by Third-Party Vendor	5.9	3.1	169
Overall System Uptime Guarantees	7.4	2.7	179
Geographic Accessibility	8.3	2.0	177
Other	7.3	2.6	162

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tant to respondents who use small TPM vendors to service their equipment. Small TPM vendors typically do not have large parts inventories.

- Exhibit V-2 lists users who are considering or using third-party maintenance. As the chart indicates, the percentage of respondents currently using TPM has fallen, but the percentage considering TPM has increased by an equal amount.

- Several OEM service vendors such as Burroughs, Cray, DEC, and CDC have a very high percentage of respondents who are currently using or considering TPM on some piece of DP equipment. This indicates that these users have a current requirement for expanded service and may be most receptive to a single-source contract (see below).

- Exhibit V-3 lists user ratings of third-party maintenance as provided by selected vendors. Surprisingly, user satisfaction with some TPM vendors is equal to or better than their satisfaction with service from OEMs. Tymshare, for example, ranks highest with 7.8. Overall, however, user satisfaction with TPM vendors (average = 7.3) is not as high as with the OEM service vendors (average = 8.2).

- User ratings of TPM by product is shown in Exhibit V-4. Users rated TPM service in several areas substantially below average. TPM service for terminals, for example, was rated only 6.7. This low rating was due primarily to poor response time. Users complained that service typically took several days and that callbacks were common.

- Service of obsolete peripheral equipment, such as key punches, tended to receive high user ratings primarily because users know that service options are limited. TPM vendors who service software were rated very high by users – yet another indication that users' demands for software support have gone substantially unanswered by OEM vendors.

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EXHIBIT V-2

USERS CONSIDERING OR CURRENTLY USING
THIRD-PARTY MAINTENANCE
(On Any Piece of DP Equipment)

VENDOR	CURRENTLY USING TPM FOR SOME EQUIPMENT (Percent)		ARE NOT NOW USING TPM, BUT HAVE CONSIDERED (Percent)	
	1984	1983	1984	1983
All Vendors	24.6%	30.6%*	38.2%	32.0%*
Amdahl	20.0	14.7	46.7	38.2
Burroughs	41.9	39.3	10.5	7.1
CDC	36.1	54.2	29.2	37.5
Cray	44.4	40.0	40.0	20.0
DEC	41.5	50.0	47.8	50.0
Data General	32.0	42.9	47.1	38.1
Honeywell	15.9	12.1	45.9	24.2
IBM	11.8	22.6	41.3	41.5
NAS	25.0	30.0	44.0	40.0
Univac	7.7	25.8	30.6	9.7

* Adjusted to compensate for the removal of Perkin Elmer and Tandem from last year's data.

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EXHIBIT V-3

USER RATINGS OF THIRD-PARTY MAINTENANCE BY SELECTED VENDORS

TPM VENDOR	RATING (1-10)
All Vendors	7.3
Braegen	6.5
CDC Comma	7.5
Sorbus	7.2
TRW	6.8
Tymshare	7.8
Other	7.4

Rating: 1 = Low, 10 = High   Number of Responses: 84
(Refer to INPUT's 1984 Third-Party Maintenance Study for
more detailed information.)

EXHIBIT V-4

- 103 -

USER RATINGS OF THIRD-PARTY MAINTENANCE BY PRODUCT

PRODUCT	RATING (1 - 10)	NUMBER OF RESPONSES
All Products	7.3	84
CPU	7.5	17
Disk Drive	6.7	9
Key Punch	8.4	5
Memory	8.0	2
Plotter	7.5	4
Printer	7.2	25
Software	9.0	3
Tape Drive	8.0	1
Terminal	6.7	18

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C.   TPM CONTRACT REQUIREMENTS

- User requirements for TPM contract features are shown in Exhibit V-5. The majority of users receive on-site coverage, Monday through Friday, with a two to four hour response time.

- Only a very small percentage of the large system users INPUT interviewed felt that depot or mail-in service was acceptable. Well over 90% said that on-site service was preferred, even for transportable items such as terminals or circuit boards.

- The average response time requirement for TPM vendors was between two and three hours (depending on the product). This is considerably over the 1.7 hours average response time requirement of OEM service vendors listed in Exhibit IV-5. The average is higher because response time requirements for TPM vendors also include low-priority items such as terminals. User response time requirements for high-priority items, such as CPUs, are comparable for TPM and OEM service vendors.

- Almost all the respondents who use third-party maintenance require a maintenance contract. While per-call service is used, it primarily applies to low-use items such as extra printers or terminals, key punches, etc.

D.   SINGLE-SOURCE MAINTENANCE

- Single-source maintenance can be defined as the use of a single-service contract, managed by one vendor, that covers service for all DP products at a single site. Usually, but not always, the vendor administering the contract is also the main CPU service vendor.

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EXHIBIT V-5

USER CONTRACT REQUIREMENTS FOR THIRD-PARTY MAINTENANCE

CONTRACT FEATURES	RESPONDENTS CURRENTLY USING (Percent)	NUMBER OF RESPONSES
Maintenance Contract *	85.9%	73
Per Call (i.e. No Contract) *	15.7	13
Response Time of: *		
2 Hours	45.1	32
4 Hours	25.0	18
8 Hours	12.9	9
Other	19.4	13
Type of Coverage:		
Monday – Friday	100.0	78
Saturday	22.1	17
Sunday	18.2	14

* Will not total 100% because some users have more than one Third-Party Maintenance vendor

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- Single-source maintenance is growing in popularity among both users and vendors. Vendors view single-source contracts both as protection against service-related competition and as an opportunity to expand service revenue. Users, on the other hand, see single-source contracts as having three main advantages:

  - It improves service responsiveness.

  - It avoids finger pointing.

  - It is more convenient to the user.

- Exhibit V-6 lists user ratings of single-source maintenance features. Clearly, the most important feature of single-source maintenance is the fact that it eliminates the possibility of finger pointing - that is, it places responsibility for maintenance on just one party. The problem of accountability is becoming more frequent as the number of vendors at each site grows and as the interdependence among different pieces of equipment increases. Users recognize that even a single-source vendor would not necessarily correct the problem. One user complained, for example, that finger pointing between the hardware and software engineer was common - and this in a single-vendor shop.

- Improved knowledge of the site is another important feature users look for in single-source maintenance. Users feel that having just one FE who can supervise service on all the DP equipment would result in improved service, primarily because that FE would be familiar with and have a service history of each piece of equipment at the site. Users feel increased site information could lead to improved diagnostics and response/repair time.

- There is a growing acceptance of single-source maintenance despite the fact that some DP managers feel threatened by the fact that the single-source vendor is performing many of the manager's duties. Exhibit V-7 shows the overall growth in user ratings of the importance of single-source maintenance.

EXHIBIT V-6

USER RATINGS OF IMPORTANCE OF SINGLE-SOURCE
MAINTENANCE FEATURES

FEATURE	RATING (1 –10)	STANDARD DEVIATION	NUMBER OF RESPONSES
Improved Convenience	7.4	2.3	334
Improved Response Time	7.7	2.2	334
Knowledge of Site	7.8	2.2	335
(Maintenance) Reputation of Single–Source Vendor	7.6	2.3	336
Single–Source Maintenance Avoids "Finger Pointing"	8.3	2.2	332

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EXHIBIT V-7

THE IMPORTANCE TO USERS OF A SINGLE SOURCE OF MAINTENANCE

VENDOR	1984 MEAN (1 - 10)	1983 MEAN (1 - 10)	1983 - 1984 Percent Increase (Decrease in Importance)
All Vendors	7.2	6.8 *	5.9% *
Amdahl	6.0	4.7	27.7
Burroughs	7.0	7.4	(5.4)
CDC	7.7	6.9	11.6
Cray	5.9	7.6	(22.4)
DEC	6.6	6.8	(2.9)
Data General	7.5	8.3	(9.6)
Honeywell	7.7	8.3	(7.2)
IBM	6.9	6.2	11.3
NAS	7.7	6.4	20.3
UNIVAC	7.7	7.3	5.5

* Adjusted to compensate for the removal of Perkin Elmer and Tandem from last year's data.

- There is a high correlation between user attitudes toward single-source maintenance and user experience with the OEM service. Users experiencing a high level of satisfaction with their OEM vendor's services are likely to rate single service maintenance high. Users that are dissatisfied with the OEM's service typically do not favor single-source maintenance.

E.   FUTURE OF THIRD-PARTY AND SINGLE-SOURCE MAINTENANCE

- Use of third-party maintenance will continue to grow mainly because selected TPM vendors offer a higher quality of service than is offered by the OEM service vendor and because TPM vendors represent smaller equipment manufacturers in the service market. Price of maintenance is definitely a secondary issue.

- Users will be looking for faster response time, adequate spares, and experienced FEs as they evaluate TPM vendors. The lack of advanced technological features such as remote diagnostics or computerized dispatching will not affect TPM vendors unless it causes service to deteriorate.

- Many TPM vendors have a distinct advantage in the service marketplace because they are local and more available to the user. But the lack of spares remains one of the most recurring complaints about local TPM vendors.

- Single-source maintenance is growing more because vendors set it as a potential revenue source than because of user demand. Still, a large portion of users are interested in unifying their multivendor shops in order to improve overall systems performance.

- Most of the users INPUT interviewed seemed to indicate that single-source maintenance was important, but only as it applied to the CPU and major

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peripherals. Off-site workstations and spare terminals were usually not considered essential to system performance and therefore not necessarily included in the evaluation of single-source maintenance.

- Overall, users will support both third-party and single-source maintenance, but only if the vendor can demonstrate improved service quality and system performance.

VI CUSTOMER SERVICE PRICING

A. EFFECTS OF CUSTOMER SERVICE PRICING

- Users of large-scale systems continue to resist service price increases, particularly when there is no corresponding increase in system reliability or availability. Many users seem to think that service prices should decrease because:

  - Hardware prices are decreasing.

  - Hardware reliability is increasing.

  - Competition from third-party maintenance organizations (and in some cases from other vendors) has been based primarily on lower service prices.

- Resistance to service price increases will be of critical importance to customer service managers who are already under pressure to run their departments as profit centers. New revenue sources should be identified in order to increase field service profitability.

- While users clearly expect more competitive service pricing, a high quality of service is an even more important requirement. Exhibit VI-I demonstrates that pricing is not an important factor in computer purchase decision making. The majority of large-system users indicated that price was much

- III -

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EXHIBIT VI-1

USER RATINGS OF IMPORTANCE OF PRICE IN
COMPUTER PURCHASE DECISION MAKING

VENDOR	RATING	STANDARD DEVIATION	NUMBER OF RESPONDENTS
All Vendors	6.7	2.0	334
Amdahl	7.0	2.6	20
Burroughs	6.9	1.8	31
CDC	6.1	1.9	36
Cray	6.3	2.7	9
DEC	6.6	2.0	41
Data General	6.5	1.7	25
Honeywell	6.8	2.0	44
IBM .	6.8	1.9	45
NAS	6.8	2.4	32
UNIVAC	7.1	2.1	51

less important in purchase decisions than such factors as uptime/system availability and field engineer response time.

- Exhibit VI-I indicates that, at least during the purchase stage, price is considered secondary to actual service performance. However, after the initial purchase decision has been made, maintenance pricing becomes a more important concern. Almost 5% of the respondents to the INPUT survey felt that a lower price for service was the single most important change that the vendor could make. (This 5% was spread evenly among the vendors).

- INPUT's findings of price insensitivity at purchase time is corroborated by a recent study by the Association of Field Service Managers. The AFSM study found that customers of high-tech equipment rated system reliability as more important than price of equipment in the equipment selection process.

- There are several reasons for price insensitivity at time of purchase:

  - Service prices appear relatively insignificant in comparison to the price of the total system.

  - Users complain that there is no accurate way to judge the competence of competitive service vendors, particularly at the purchase decision stage.

  - Even when qualified competition is available, users report they are reluctant to entrust service on a new product to an untested service vendor.

- Service price insensitivity during the purchase decision process can be used by maintenance vendors to increase revenues. This is particularly true if users agree to purchase long-term maintenance contracts at the time of initial system purchase. Other potential revenue sources include:

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- Offering users expanded maintenance services.

- Incorporating new revenue sources into the customer services function (e.g., equipment sales, upgrades, etc.).

• The development of service pricing strategy and users' reaction to it are discussed below.

B. USER REQUIREMENTS FOR EXTENDED SERVICES AND ATTITUDES TOWARD PREMIUMS

• As noted above, service price sensitivity is growing among maintenance customers. A large portion of users, however, are willing to pay substantial premiums for selected extended or improved services. Over 80% of the large system users surveyed required some extended services, and the premiums they were willing to pay ranged from 1% to over 100% beyond their basic service contracts.

• By offering extended services, vendors have the opportunity to increase service revenue substantially - and the demand for extended services is growing. Exhibit VI-2 demonstrates that user demand for almost all areas of extended services has grown between 1983 and 1984. In addition to demand, the premium that users are willing to pay has also generally grown.

• Exhibit VI-2 shows that preventive maintenance and field changes during off-prime hours are by far the most popular extended services requested by users.

• Eighty-two percent of the large system users surveyed said they had a need for this service. Over 50% of the users said they had a requirement for guaranteed response time, on-site spare parts, remote diagnostics, and/or occasional shift coverage.

- 114 -

EXHIBIT VI-2

USER REQUIREMENTS FOR EXTENDED SERVICES AND
ATTITUDES TOWARD PREMIUMS

EXTENDED SERVICE	PERCENTAGES OF RESPONDENTS REQUIRING EXTENDED SERVICE		AVERAGE PREMIUM RESPONDENTS WILLING TO PAY OVER BASIC MAINTENANCE	
	1984	1983	1984	1983
Stand-By Coverage During Critical Periods	49.0%	43.2%	10.9%	8.8%
Guaranteed Uptime	36.5	34.9	7.8	10.8
Guaranteed Response Time	61.3	54.3	5.1	4.0
On-Site Spare Parts	53.3	56.5	2.6	2.8
Remote Diagnostics	55.8	47.5	2.8	3.1
Preventive Maintenance and Field Changes During Off-Prime Hours	82.0	70.7	4.7	3.2
Occasional Shift Coverage	53.1	31.5	6.8	4.0
Full-Time, On-Site Service Engineer	32.3	30.6	7.1	2.6
Guaranteed Repair Time (Hardware)	39.2	29.0	8.4	9.8
Guaranteed Turn-around on Software	28.0	20.1	4.9	4.6

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- Although there is a great demand for the extended services listed above, users are generally not willing to pay high premiums for these services. For example, users are willing to pay only 2.6% over their basic maintenance charge for on-site spare parts and 2.8% for remote diagnostics.

- It is important to note that most users reject the concept of paying a premium for services that are already covered in the basic service contract. For example, the majority of respondents requiring on-site spare parts felt that they were supplying a service to the vendor and therefore should not have to pay any premium for this service.

- On the other hand, there are some services, such as standby coverage during critical periods and occasional shift coverage, that the users recognize as being an important - and expensive - supplemental service. In many cases, users reported that the premium they were willing to pay depended upon the complexity of the potential problem.

- Users of large systems seem to have an inbuilt distrust of any guaranteed extended service. They are not looking for an insurance policy that will reimburse them when their machine goes down, but they are looking for assurance - a guarantee - that the machine will not fail. Comments such as "a guaranteed repair time is just not possible" kept the overall percentage of respondents requiring these services quite small. When users felt that such guarantees were valid, however, they were willing to pay high premiums.

- Price sensitivity by users indicates that the service market can be divided along price lines. Exhibit VI-3 shows a premium percentage distribution that is consistent from one extended service to another.

- As mentioned earlier, most users requiring extended services believe that the services should be covered as part of the basic maintenance charge and therefore they were not willing to pay any extra premium. This is particularly

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EXHIBIT VI-3

DISTRIBUTION OF REASONABLE PREMIUMS FOR EXTENDED SERVICES

EXTENDED SERVICE	PERCENTAGE OF USERS REQUIRING EXTENDED SERVICE WHO WILL PAY PREMIUM OVER BASIC MAINTENANCE CHARGE						
	PREMIUM GROUPS						
	0%	1-5%	6-10%	11-16%	16-30%	31-50%	51+%
Standby Coverage During Critical Periods	42.2%	18.4%	14.2%	3.0%	10.1%	4.8%	3.6%
Guaranteed Uptime	56.3	11.2	15.9	3.2	7.2	4.0	2.4
Guaranteed Response Time	69.9	11.3	12.3	2.9	6.7	0.5	1.5
On-Site Spare Parts	75.0	11.4	8.6	1.6	22.2	1.1	–
Remote Diagnostics	68.7	17.1	8.8	1.0	3.6	0.5	–
PM and Engineering Changes Installed Off-Prime Shift	58.7	13.5	18.4	3.6	4.6	1.5	–
Occasional Shift Coverage Versus Fixed Schedule	42.9	26.8	20.2	1.6	5.4	1.6	1.0
Full-Time, On-Site Service Engineer	61.3	4.5	6.3	10.8	13.5	–	3.6
Guaranteed Repair Time (Hardware)	54.8	11.1	16.3	3.7	8.1	4.4	0.7
Guaranteed Turn-around on Software Problems	58.4	12.3	16.8	5.6	5.6	1.1	–

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valid for guaranteed response time (of the field engineer), on-site spare parts, and remote diagnostics.

- Exhibit VI-3 indicates that the percentage of users willing to pay premiums drops rapidly after a 10% increase in price. As the exhibit shows, however, some users are willing to pay a premium of over 50% for selected services.

- It is possible to determine the optimal increase by multiplying the premium the user is willing to pay by the percentage of users agreeing to pay that same premium. For example, in Exhibit VI-3, the optimal premium to charge for guaranteed uptime is between 6-10%. The typical vendor will derive the greatest profitability from this premium level.

- Even though users are becoming more price sensitive with regard to service, the average percentage of users willing to pay some premium has grown since 1983. Exhibit VI-4 indicates that the fastest growing areas include:

  - Full-time on-site field engineer.

  - Occasional shift coverage.

  - Preventive maintenance during off-prime hours.

  - Remote diagnostics.

- Extended services that users are increasingly reluctant to pay any extra charge for are:

  - Guaranteed uptime.

  - On-site spare parts.

  - Guaranteed repair time (software).

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EXHIBIT VI-4

- 119 -

USERS WILLING TO PAY SOME PREMIUM* FOR EXTENDED SERVICES
(Percent)

EXTENDED SERVICES	PERCENT OF USERS WHO WILL PAY A PREMIUM		1983-1984 PERCENT INCREASE (DECREASE)
	1984	1983	
Standby Coverage During Critical Periods	53.8%	52.9%	1.7%
Guaranteed Uptime	43.7	54.9	(20.4)
Guaranteed Response Time	35.1	39.8	(11.8)
On-Site Spare Parts	25.0	30.1	(16.9)
Remote Diagnostics	31.3	29.2	7.2
PM and Engineering Changes Installed Off-Prime Shifts	41.3	34.5	19.7
Occasional Shift Coverage	57.1	46.1	23.9
Full-Time On-Site Engineer	38.7	29.3	32.1
Guaranteed Repair Time (Hardware)	51.1	48.9	4.5
Guaranteed Repair Time (Software)	46.2	53.8	(14.1)

* Some Premium = 0.5% or more of Basic Monthly Maintenance Charge (BMMC)

INPUT
FLS5

- Guaranteed response time.

- The fact that users are willing to pay any extra premium is significant because INPUT has found that users generally underrate the premiums they would be willing to pay for extended services. INPUT estimates that, based on past performance, users will accept premiums of 85-100% more than they listed in Exhibits VI-2 and VI-3.

C.   NEW REVENUE SOURCES FOR FIELD ENGINEERING

- Expanding the role of the field engineer is a second area that offers the potential of increasing field service revenue. Unlike the premium extended for services, however, changes in the FE's role may result in an immediate negative reaction from the user if the change is not instituted properly.

- The role of the FE can best be expanded in the direction of increased customer support. Many of the users surveyed by INPUT, both in 1983 and 1984, reported that advice from their FE is highly valued and is an integral part of the equipment selection and purchase process. Users were equally adamant, however, that the FE not be placed in a sales role. Users opposed having the FE in a direct sales role for two reasons:

  - They felt it would bias an otherwise objective source of information, particularly if the FE received sales commissions.

  - The sales role would only add other obligations to an already overburdened FE.

- In 1983, users generally favored the FE in a sales role for add-on equipment and service contracts. The selling of supplies or new equipment by the FE was approved by the majority of respondents.

INPUT

- Exhibit VI-5 lists user attitudes toward the FE taking orders for equipment and service in 1984. As the exhibit indicates, the majority of users oppose the FE taking orders for any product or service. Users would respond "The FE's job is to repair my equipment - that's his only job!"

- Individual users tend to favor or oppose the FE in a sales role depending on how they think it will affect their service. If service is already good, they see no need to change it and therefore oppose sales support by the FE. If service needs to be improved, the user tends to support any change in the FE's role that may improve service. For example:

    - DEC users report a high system availability rate, as shown in Exhibit IV-2, and tend to oppose having the FE in any sales-related role.

    - Data General users, on the other hand, have a relatively low system availability rate and yet are much more supportive of the new sales role for the FE.

- As in last year's survey, a large portion of 1984 respondents tended to favor the FE taking orders for service contracts and upgrades. And, like last year's users, the majority were overwhelmingly opposed to the FE taking orders for software products. (One user responded "My FE can barely keep one hat and you want him to wear three?") Users also opposed the FE taking orders for supplies and new orders of equipment.

- Users will continue to oppose changing the role of the FE when they perceive that such a change will result in a lower quality of service. Vendors should note, however, that there appears to be a substantial demand for sales support in selected areas. These areas include:

    - Service contracts.

INPUT

EXHIBIT VI-5

USER ATTITUDES TOWARD FIELD ENGINEER TAKING
ORDERS FOR EQUIPMENT/SERVICE

FIELD ENGINEER TAKING ORDERS FOR:	FAVOR (Percent)	NEUTRAL (Percent)	OPPOSED (Percent)
Supplies	27.9%	21.2%	50.9%
Add-On Equipment	29.4	10.2	60.5
New Models of Equipment	22.1	8.4	69.5
Upgrades	39.7	7.0	53.3
Service Contracts	42.2	7.8	50.0
Software	19.7	7.2	73.1

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-       Upgrades.

●   If vendors concentrate in these areas they can increase field service revenue and improve user satisfaction.

D.   SERVICE-RELATED PRICE SENSITIVITY AND THE PRODUCT LIFE CYCLE

●   As noted in section A of this chapter, users are not service price sensitive during the equipment purchase stage. After the equipment has been purchased, however, users become more and more price sensitive.

●   Exhibit VI-6 graphically illustrates the relationship between the product life cycle and the users' service price sensitivity. During growth stage of the product life cycle, users are not service price sensitive. Users report two major reasons for this:

-       The relatively low cost of service compared to the initial system cost.

-       The high premium users set on system availability.

●   As the product matures and users gain more experience with service they become more service price sensitive. This is caused by several factors:

-       Service prices stand alone after purchase and become one of the most substantial ongoing costs in an IS department.

-       Competition, in the form of third-party maintenance organizations, gains experience in servicing the machine. These organizations tend to have a competitive price advantage.

- 123 -

INPUT

EXHIBIT VI-6

USER PRICE SENSITIVITY AS AFFECTED BY LARGE-SYSTEM
PRODUCT LIFE CYCLE
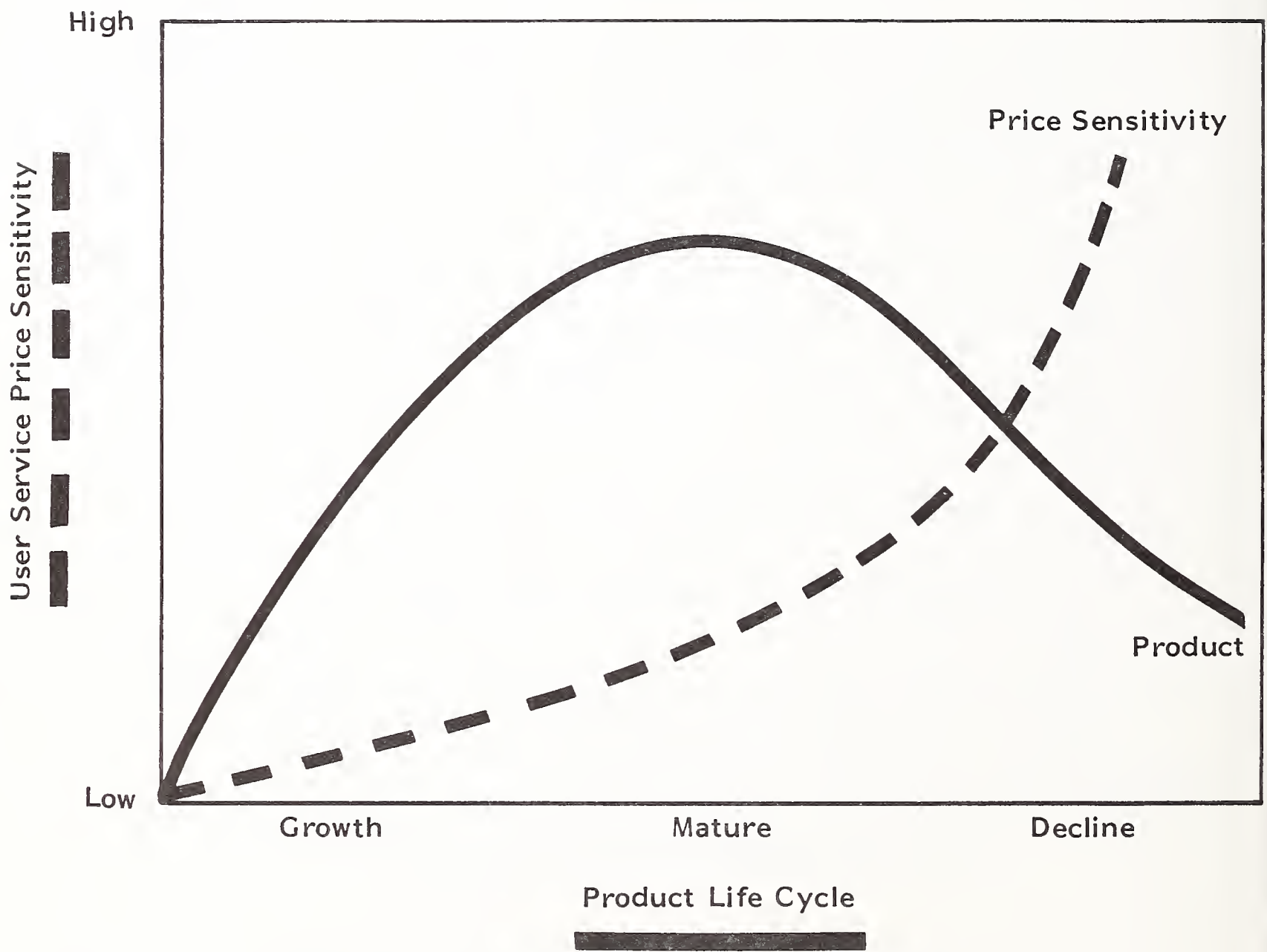
Product Life Cycle

- In the last stage of the product life cycle (decline), users typically become very price sensitive. One of the major reasons for this is that the machines are becoming less reliable and have lower processing capacity than many of the newer machines. Users view increases in service pricing as more and more unacceptable because of the relative degradation of their equipment.

- Most users will upgrade their equipment at some time during the decline stage of the product life cycle. There are, however, exceptions to this process that result in lower user price sensitivity to service even in the "decline" stage. Some of these exceptions include:

    - Software applications that make it difficult or impossible for the user to upgrade to new hardware.

    - Internal financial restraints that prevent purchase of new hardware.

    - Regional or local hardware applications that cannot be changed in a unilateral manner. (This was commonly reported in national and multi-national companies.)

- Vendors have adapted to user price sensitivity, as shown in Exhibit VI-7. In this example, service pricing for two IBM products has fallen dramatically since product introduction. While many factors are at work in reducing service prices, user price sensitivity is an important factor in this process.

INPUT

EXHIBIT VI-7

MONTHLY MAINTENANCE CHARGE ON IBM MODEL 3033 AND 3031
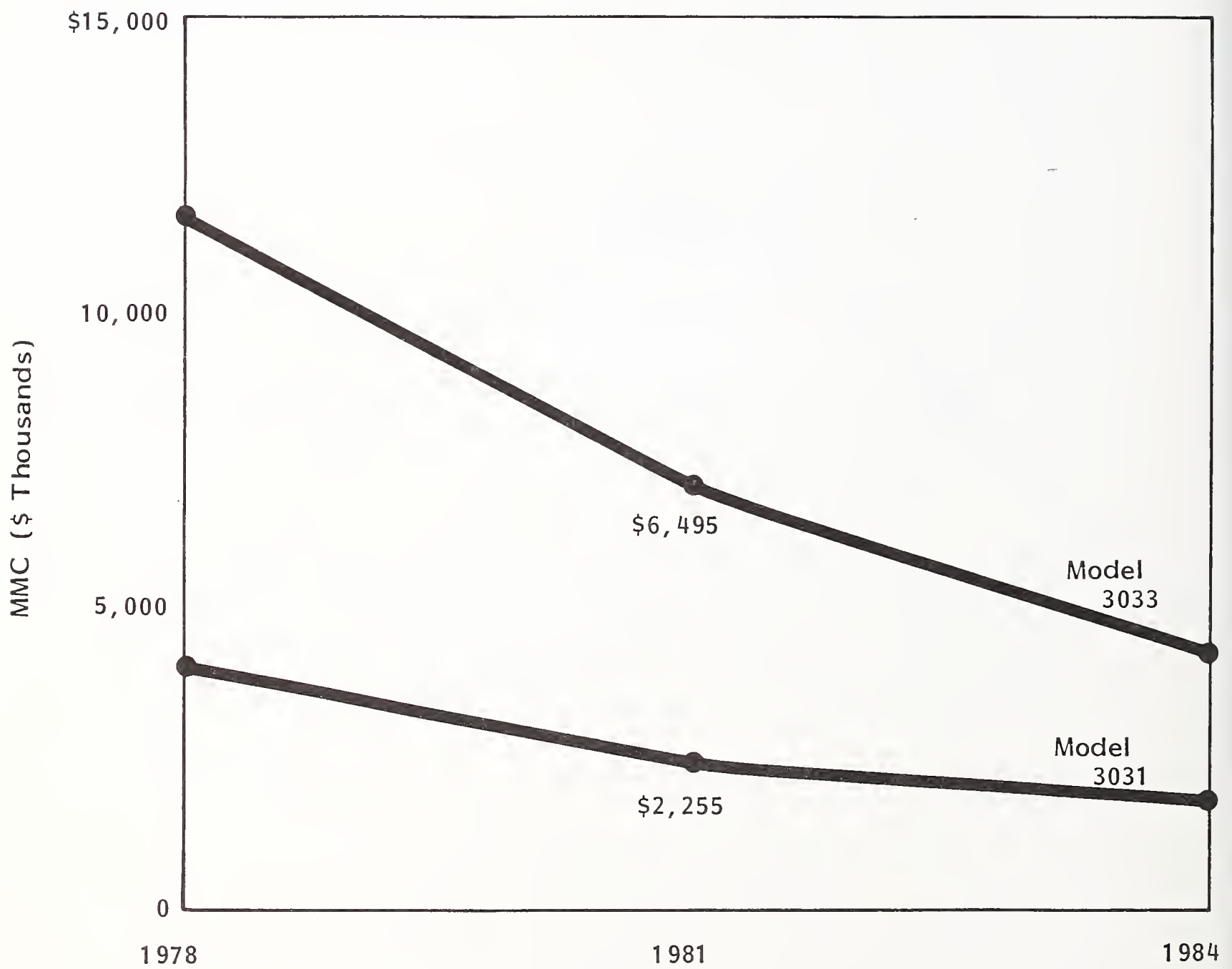
APPENDIX A: DATA BASE FORMAT

APPENDIX A: DATA BASE FORMAT

A.   DATA BASE OVERVIEW

- The user requirements data base is held at INPUT on Apple III computers using the CP/M operating system.

- Data entry and some analysis was accomplished using dBASE II, a relational data base management program developed and sold by Ashton-Tate (10150 West Jefferson Boulevard, Culver City, California 90203).

- The data base of large- and medium-system user requirements is contained in five data files. These include:

    - LSIA.DBF   Questions 1A-4B.

    - LSIB.DBF   Questions 5A-9J2.

    - LSIC.DBF   Questions 10A1-11F.

    - LSID.DBF   Questions 12A1-19.

    - LSIE.DBF   Questions 20A-22E, Demographics.

INPUT

- All files contain vendor information and catalog numbers in order to facilitate analysis. For example, if readers wish to analyze the responses of users of IBM equipment, they can select IBM as a vendor and analyze only those responses. Catalog numbers are discussed below.

B.   DESCRIPTION OF FILES

- Exhibits A-1 through A-5 list the field names and other information of the five files as originally created under dBASE II.

    - Fields are easily recognizable by the corresponding question numbers and/or data cell descriptions in the questionnaire reproduced in Appendix B.

    - The listing contains additional information about the data type, the width of the field, and the number of decimal positions. For example, in Exhibit A-1, field number 003 (Q1A) is type N (numeric), three characters wide, and contains no decimal positions.

- As noted above, there are five files in the large-system users' data base: LSIA.DBF-LSIE.DBF. Each file contains a range of questions. It is necessary to utilize the entire data base in order to analyze completely any individual questionnaire. Each individual questionnaire has a unique catalog number that is consistent throughout the five files.

C.   ANALYSIS OF THE DATA BASE FILES

- INPUT clients may want to do their own statistical analysis of the data contained in the large-systems user requirements survey. This can be done in several ways:

INPU

LSIA . DBF

FIELD	NAME	TYPE	WIDTH	DECIMAL
001	CATNO	N	006	001
002	VENDOR	C	020	
003	Q1A	N	003	
004	Q1B	N	003	
005	Q1C	N	003	
006	Q1D	N	003	
007	Q1E	N	003	
008	Q2A	N	003	
009	Q2B	N	003	
010	Q2C	N	003	
011	Q2D	N	003	
012	Q2E	N	003	
013	Q2F	N	003	
014	Q3A	N	005	001
015	Q3B	N	005	001
016	Q4A	N	005	001
017	Q4B	N	005	001

INPUT
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EXHIBIT A-2

LSIB . DBF

FIELD	NAME	TYPE	WIDTH	DECIMAL
001	CATNO	N	006	001
002	VENDOR	C	020	
003	Q5A	N	005	001
004	Q5B	N	005	001
005	Q6A	N	005	001
006	Q6B	N	005	001
007	Q7A	N	006	001
008	Q7B	N	006	001
009	Q8A	N	003	
010	Q8B	N	004	
011	Q8C	N	004	
012	Q9A1	N	001	
013	Q9A2	N	004	
014	Q9B1	N	001	
015	Q9B2	N	004	
016	Q9C1	N	001	
017	Q9C2	N	004	
018	Q9D1	N	001	
019	Q9D2	N	004	
020	Q9E1	N	001	
021	Q9E2	N	004	
022	Q9F1	N	001	
023	Q9F2	N	004	
024	Q9G1	N	001	
025	Q9G2	N	004	
026	Q9H1	N	001	
027	Q9H2	N	004	
028	Q9I1	N	001	
029	Q9I2	N	004	
030	Q9J1	N	001	
031	Q9J2	N	004	

LSIC . DBF

FIELD	NAME	TYPE	WIDTH	DECIMAL
001	CATNO	N	006	001
002	VENDOR	C	020	
003	Q10A1	N	003	
004	Q10A2	N	003	
005	Q10B1	N	003	
006	Q10B2	N	003	
007	Q10C1	N	003	
008	Q10C2	N	003	
009	Q10D1	N	003	
010	Q10D2	N	003	
011	Q10E1	N	003	
012	Q10E2	N	003	
013	Q10F1	N	003	
014	Q10F2	N	003	
015	Q10G1	N	003	
016	Q10G2	N	003	
017	Q10H1	N	003	
018	Q10H2	N	003	
019	Q10I1	N	003	
020	Q10I2	N	003	
021	Q10J1	N	003	
022	Q10J2	N	003	
023	Q11A	N	001	
024	Q11B	N	001	
025	Q11C	N	001	
026	Q11D	N	001	
027	Q11E	N	001	
028	Q11F	N	001	

INPUT
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EXHIBIT A-4

LSID . DBF

FIELD	NAME	TYPE	WIDTH	DECIMAL
001	CATNO	N	006	001
002	VENDOR	C	020	
003	Q12A1	N	003	
004	Q12A2	N	003	
005	Q12B1	N	003	
006	Q12B2	N	003	
007	Q12C1	N	003	
008	Q12C2	N	003	
009	Q12D1	N	003	
010	Q12D2	N	003	
011	Q12E2	N	003	
012	Q12F1	N	003	
013	Q12F2	N	003	
014	Q13	N	001	
015	Q14	N	001	
016	Q15A	C	030	
017	Q15B	C	020	
018	Q16A	N	001	
019	Q16B	N	001	
020	Q17A	N	001	
021	Q17B	N	001	
022	Q17C	N	001	
023	Q17D	N	001	
024	Q18A	N	001	
025	Q18B	N	001	
026	Q18C	N	001	
027	Q19	N	003	

EXHIBIT A-5

LSIE . DBF

FIELD	NAME	TYPE	WIDTH	DECIMAL
001	CATNO	N	006	001
002	Q20A	N	003	
003	Q20B	N	003	
004	Q20C	N	003	
005	Q20D	N	003	
006	Q20E	N	003	
007	Q20F	N	003	
008	Q20G	N	003	
009	Q20H	N	003	
010	Q21	N	003	
011	Q22A	N	003	
012	Q22B	N	003	
013	Q22C	N	003	
014	Q22D	N	003	
015	Q22E	N	003	
016	ZIP	C	005	
017	INDUSTRY	C	030	
018	AREA	C	003	
019	VENDOR	C	020	
020	PRODUCT	C	020	

INPUT
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- Use the data base printout of the large-systems user requirements survey. This report contains the actual printout of all 345 questionnaire responses. With over 130 data items per questionnaire, this report contains a tremendous amount of data and can be unwieldly for extensive analysis. The data base printout should be used primarily to search one or two responses at a time.

- Call the INPUT Hotline and request further information about the data in any INPUT report.

- Use the raw data diskettes that are mailed to all clients of the INPUT Customer Services Program. These data diskettes contain all of the statistical responses from the user survey. (Some demographic information has been removed to ensure user confidentiality).

- Clients who wish to use the raw data diskettes supplied by INPUT must have the following computer configuration:

  - Computer: Apple II+, Apple IIe, or Apple III.

  - Operating system: CP/M.

  - Application program: dBASE II (ABSTAT, optional).

- Once this configuration is available, the client can perform elementary statistical analysis using dBASE II. For more sophisticated analysis, the client may wish to obtain a statistical analysis program. INPUT used ABSTAT, a statistical program that has the capability of analyzing dBASE II files. ABSTAT is produced by Anderson-Bell, P.O. Box 191, Carson City, Colorado 81212.

- 134 -

APPENDIX B: QUESTIONNAIRE

APPENDIX B

1. On a scale of 1-10, how important are each of the following maintenance factors in computer purchase decision-making: (1 = least important, 10 = most important)

   a. Price (of maintenance) _____
      (Q1A)

   b. Uptime or system availability _____
      (Q1B)

   c. Response time _____
      (Q1C)

   d. Repair time _____
      (Q1D)

   e. Vendor reputation _____
      (Q1E)

2. On a scale of 1-10, please rate your maintenance vendor in the following categories:

   a. Hardware service engineers' communication _____
      (Q2A)

   b. Software service engineers' communication _____
      (Q2B)

   c. Overall service image of the vendor _____
      (Q2C)

   d. Dispatching _____
      (Q2D)

   e. Escalation _____
      (Q2E)

   f. General responsiveness of the vendor _____
      (Q2F)

3. a. What is your requirement for hardware response time?_____(hours)
      (Q3A)

   b. What do you receive?_____(hours)
      (Q3B)

4. a. What is your requirement for hardware repair time?_____(hours)
      (Q4A)

   b. What is the average repair time (once the FE is on site)?_____(hours)
      (Q4B)

5. a. What is your requirement for software response time?_____(hours)
      (Q5A)

   b. What do you currently receive?_____(hours)
      (Q5B)

6. a. What is your requirement for software fixes?_____(hours)
      (Q6A)

   b. What do you currently receive?_____(hours)
      (Q6B)

7. a. What overall level of system availability do you require?_____%
      (Q7A)

   b. What level of system availability are you experiencing?_____%
      (Q7B)

INPUT

8. a. How many system interruptions do you have each month?_____
    (Q8A)

    b. What percentage of system interruptions are hardware related?_____ %
    (Q8B)

    c. And software related?_____ %
    (Q8C)

9. Do you have a requirement for any of the following services, and if so, what would you consider a reasonable premium to pay over the basic maintenance charge?

Service	1 = Yes, 2 = No Yes/No	Reasonable Premium (percent)
a. Stand-by coverage during critical periods	_____ (Q9A1)	_____ % (Q9A2)
b. Guaranteed uptime	_____ (Q9B1)	_____ % (Q9B2)
c. Guaranteed response time	_____ (Q9C1)	_____ % (Q9C2)
d. On-site spare parts	_____ (Q9D1)	_____ % (Q9D2)
e. Remote diagnostics	_____ (Q9E1)	_____ % (Q9E2)
f. Preventive maintenance and field changes during off-prime hours	_____ (Q9F1)	_____ % (Q9F2)
g. Occasional shift coverage (versus fixed schedule)	_____ (Q9G1)	_____ % (Q9G2)
h. Full-time, on-site service engineer	_____ (Q9H1)	_____ % (Q9H2)
i. Guaranteed repair time (hardware)	_____ (Q9I1)	_____ % (Q9I2)
j. Guaranteed turnaround on software fixes	_____ (Q9J1)	_____ % (Q9J2)

INPUT

10. a. Please rate, on a scale of 1-10, your requirements for the following vendor goods and services.

   b. Please rate your current level of satisfaction with the services you receive from your maintenance vendor.

Vendor Goods & Services	Requirement (a) 1-10	Current Level (b) 1-10
a. Planning (environmental, physical site installation)	(Q10A1)	(Q10A2)
b. Consulting	(Q10B1)	(Q10B2)
c. Documentation	(Q10C1)	(Q10C2)
d. Training	(Q10D1)	(Q10D2)
e. Sales of supplies	(Q10E1)	(Q10E2)
f. Add-on sales	(Q10F1)	(Q10F2)
g. Site audits	(Q10G1)	(Q10G2)
h. Relocation/deinstallation	(Q10H1)	(Q10H2)
i. Hardware maintenance	(Q10I1)	(Q10I2)
j. Software maintenance	(Q10J1)	(Q10J2)

11. Would you favor or oppose having the field service engineer take orders for: (1 = favor, 2 = oppose, 3 = neutral)

   a. Supplies _____ (Q11A)

   b. Add-on equipment _____ (Q11B)

   c. New models _____ (Q11C)

   d. Upgrades _____ (Q11D)

   e. Service contracts _____ (Q11E)

   f. Software _____ (Q11F)

INPUT

12. Please rate the importance of receiving your hardware and software support services by the following methods: (scale 1-10)

	(1-10)	
	Hardware	Software
a. Your involvement in telephone diagnosis: working with support center	(Q12A1)	(Q12A2)
b. Your involvement with remote diagnostics and software down-line loading	(Q12B1)	(Q12B2)
c. Your replacing circuit boards, or patching software	(Q12C1)	(Q12C2)
d. Ship in/carry in to repair center	(Q12D1)	(Q12D2)
e. Consulting/software customization		(Q12E2)
f. Traditional, on-site response to trouble calls	(Q12F1)	(Q12F2)

13. Do you currently use third-party maintenance on any of your equipment?
_____ (1 = yes, 2 = no)   IF YES, GO TO QUESTION 15.
(Q13)

14. Have you considered using third-party maintenance?_____ (1 = yes, 2 = no)   IF YES, GO TO QUESTION 20. IF NO GO TO QUESTION 21.
(Q14)

15. a. Which third-party vendor are you currently using? _____
(Q15A)

b. And for which product? _____
(Q15B)

16. Do you receive third-party maintenance in: (1 = yes, 2 = no)

a. Per call _____ or b. Contract _____
(Q16A)   (Q16B)

17. If contract:

What is your response time requirement?(1 = yes, 2 = no)

a. 2 hrs._____   b. 4 hrs._____   c. 8 hrs._____
(Q17A)   (Q17B)   (Q17C)

d. Other_____
(Q17D)

INPUT

18. What type of coverage do you receive? (1 = yes, 2 = no)

    a. Mon. - Fri. _____
                         (Q18A)

    b. Saturday _____
                         (Q18B)

    c. Sunday _____
                         (Q18C)

19. On a scale of 1-10, how satisfied are you with the third-party maintenance you are now receiving? _____
                                             (Q19)

20. When considering third-party maintenance, how important are each of the following criteria to you? (1 = not important, 10 = very important)

    a. Price of third party maintenance _____
                                     (Q20A)

    b. Improved response time _____
                                     (Q20B)

    c. Third-party vendor reputation _____
                                     (Q20C)

    d. Hardware support _____
                                     (Q20D)

    e. Software support provided by the third-party vendor _____
                                     (Q20E)

    f. Overall system uptime (guarantee) _____
                                     (Q20F)

    g. Geographic accessibility _____
                                     (Q20G)

    h Other features (spares, diagnostics) _____
                                     (Q20H)

21. On a scale of 1-10, how important is a single source of maintenance to you?

    (1 = not important, 10 = very important) _____
                                                  (Q21)
    (A single source of maintenance provides a single maintenance contract for all DP products at your site.)

22. Please rate the importance of the following single source maintenance contract features: (1 = not important, 10 = very important)

    a. Improved convenience _____
                                     (Q22A)

    b. Improved response time _____
                                     (Q22B)

    c. Knowledge of site _____
                                     (Q22C)

    d. Reputation of single-source vendor _____
                                     (Q22D)

    e. Avoids "finger pointing" _____
                                     (Q22E)

INPUT

23. In your opinion, what single change should your maintenance vendor make to significantly improve the level of service?

_____

_____

_____

_____

_____

_____

THANK YOU.

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APPENDIX C: RESPONDENT USERS

APPENDIX C

RESPONDENT USERS

1st NATIONWIDE SAVINGS
ABBOTT LABORATORIES
ABSCO DISTRIBUTION
ADVEST
AGS MANAGEMENT SYSTEMS INC.
AID INSURANCE SERVICES
AL TECH SPECIALTY STEEL
ALABAMA DEPT. OF REVENUE
ALABAMA STATE UNIVERSITY
ALAMO IRON WORKS
ALBUQUERQUE PUBLIC SCHOOLS
ALL TRANS INTERNATIONAL
ALLIS CHALMERS-PLANT 2
ALLSTATE INSURANCE
AMBASSADOR COLLEGE
AMERICAN AIRLINES
AMERICAN BENEFIT PLAN ADMIN.
AMERICAN HOIST & DERRICK
AMERICAN HONDA COMPANY
ANDERSON EQUIPMENT CO.
ANDERSON LUMBER CO.
ANGLO AMERICAN AVIATION CORP.
APPALACHIAN COMPUTER SERVICE
APPLIANCE BUYERS CREDIT
ARCO
ARIZONA DEPT. PUBLIC SAFETY
ARIZONA STATE UNIVERSITY
ARKANSAS COMPUTER COMPANY
ARMELLINI EXPRESS INC.
ASSOC. WHOLESALE GROCERS
ASSOCIATED GROCERS INC.

INPUT

APPENDIX C

RESPONDENT USERS

ASSOCIATED GROCERS OF MAINE
ATLANTIC NATIONAL BANK
AUTOGRAPHICS INC.
AUTOMATIC DISTRIBUTING CORP.
B.O.C.E.S.
BADDOUR INC.
BALTIMORE GAS & ELECTRIC
BASIN ELECTRIC POWER CORP.
BAUM IRON COMPANY
BAY VIEW FEDERAL SAVINGS
BELL SYSTEMS CENTER
BLUE CROSS & BLUE SHIELD
BLUE CROSS OF ARIZONA
BLUE CROSS/BLUE SHIELD OF MN
BOEING COMPUTER SERVICE
BONNEVILLE POWER ADMIN.
BOSLER SUPPLY COMPANY
BOSTON & MAINE RAILROAD
BRIGGS AND STRATTON
BROWNING ARMS COMPANY
BURNS & MCDONNEL
BUTLER COMPUTER GRAPHICS INC.
C F BRAUN COMPANY
CALIF. DEPT. OF MOTOR VEHICLES
CALIFORNIA DEPT. OF JUSTICE
CALIFORNIA STATE UNIVERSITY
CAMPBELL SOUP COMPANY
CARMIS
CAROLINA CASUALTY INSURANCE
CATHOLIC UNIVERSITY
CENEX

- 142 -

APPENDIX C

RESPONDENT USERS

CENTRAL ARTEA DATA PROCESSING
CENTRAL BANK
CHARLESTON COUNTY
CHATHAM SUPER MARKETS
CHESSIE SYSTEMS
CHILDRENS HOSPITAL
CHITTENDEN & EASTMAN COMPANY
CIGNA CORPORATION
CITY OF ALBANY
CITY OF COSTA MESA
CITY OF GARLAND
CITY OF LUBBOCK
CITY OF OKLAHOMA CITY
CITY OF PETERSBURG
CITY OF PITTSBURGH
CITY OF PORTLAND
CITY OF TALLAHASSEE
CITY OF WINSTON-SALEM
CLAIRMONT TRANSFER
CLIMAX MOLYBDENUM CO.
COLORADO STATE UNIVERSITY
COMMUNICATIONS DATA SERVICE
COMPUTER APPLICATION SERVICES CORP.
COMPUTER ELECTION SYSTEM
COMPUTER LANGUAGE RESEARCH CO.
COMPUTER POWER INC.
COMPUTER SHARING SERVICES
COMPUTER USAGE CO.
COMTAL CORPORATION
CONCORD GENERAL MUTUAL INSURANCE
CONIFER COMPUTER SERVICE

INPUT

APPENDIX C

RESPONDENT USERS

CONOCO INC.

CONSULTEC INC

CONSUMERS POWER CO.

CONTINENTAL-EMCO COMPANY

CONTROL DATA BUSINESS CENTER

CONTROL DATA CORPORATION

CORNING GLASS CO.

CORPORATE SYSTEMS

CRANE CARRIER COMPANY

CRESSEY DOCKHAM & CO. INC.

DADE COUNTY BD. PUBLIC INSTRUC.

DANA CORPORATION

DATA COMP CORP.

DATACOM SYSTEMS CORP.

DATACOMP CORP.

DELCO ELECTRONIC

DENVER BOARD OF WATER COMM.

DIGITAL PRODUCTIONS

DUCOMMUN INC.

DURA-BOND BEARING CO.

EARLE M. JORGENSON

EAST STROUDSBERG UNIVERSITY

EASTERN ASSOCIATED COAL CO.

EASTERN UTILITIES ASSOC. SVC.

EDDIE BAUER INC.

ELECTRICAL MUTUAL LIABILITY IN

ELECTRON INFORMATION SYSTEMS

ELMHURST MEMORIAL HOSPITAL

ENERGY ENTERPRISE OF DENVER

EVANS PRODUCTS COMPANY

RESPONDENT USERS

EVERSMAN MANUFACTURING CO.
FA DAVIS & SON
FARM BUREAU INSURANCE
FARMERS INSURANCE
FBI
FEDCO INC.
FEDERAL CARTRIDGE CORP.
FEDERAL HOME LOAN BANK
FEDERAL ELECTRIC CORP.
FINSERV COMPUTER CORP.
FIRST AMERICAN TITLE
FIRST FEDERAL SAVINGS BANK
FIRST INTERSTATE BANK OF DENVER
FIRST NATIONAL BANK OF BOSTON
FLEET DATA SERVICES
FLORIDA STATE UNIVERSITY
FRANK RUSSELL COMPANY
FRITZ COMPANIES
GANGNAIL SYSTEMS
GAS SERVICE COMPANY
GELCO CORP.
GENERAL ELECTRIC
GEORGETOWN TEXAS STEEL
GIFFORD HILL AND COMPANY
GLENSHAW GLASS CO.
GLOBAL WEATHER DYNAMICS INC.
GRAHAM ELECTRONICS
GREAT LAKES TERMINAL TRANSPORT
GREATER HOUSTON TRANS-YELLOW
GTE DATA SERVICES
GULF OIL

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APPENDIX C

RESPONDENT USERS

H.D. & R.
HAMILTON/AVNET
HARRIS COUNTY CLERK
HARRIS METHODIST HEALTH SVC.
HARRY & DAVID
HARTFORD INSURANCE GROUP
HAYES INTERNATIONAL CORP.
HEALTH EXAMINERS
HEBREW NATIONAL
HERCULES
HON COMPANY
HUGHES AIRCRAFT CO.
IMPELL
INSTITUTE OF PAPER CHEMISTRY
INTEL CORP.
INTERACTIVE DATA SYSTEMS
INTERSTATE ASSURANCE COMPANY
ISSCO
ITEK CORPORATION
ITEL CORPORATION
ITT-COURIER
JACKSON NATIONAL LIFE INSURANCE
JACOBSEN & ASSOCIATES
JOB SERVICES, ND
KERR-MCGEE CHEMICAL CO.
KINDER-CARE LEARNING CENTER
KITT PEAK NATIONAL OBSERVATORY
LAWRENCE LIVERMORE LABS
LEHMAN BROTHERS KUHN LOCB, INC.
LEXINGTON COUNTY HOSPITAL
LINKABIT CORP.

APPENDIX C

RESPONDENT USERS

LONG BEACH CITY COLLEGE
LOS ALAMOS NATIONAL LAB
LUTHERAN MEDICAL CENTER
MANAGISTICS INCORPORATED
MARICOPA COMMUNITY COLLEGE
MARICOPA COUNTY HIGHWAY DEPT.
MARY BALDWIN COLLEGE
MCNEAL PHARMACEUTICAL
MEGATEK
MEMORIAL MEDICAL CENTER
MID IOWA EDUCATIONAL FACILITY
MILES LABORATORY
MISSISSIPPI EMPLOYMENT SECURITY
MOHAWK DATA SCIENCES CORP.
N.H. DEPARTMENT OF PUBLIC WORKS
NAKO CHEMICAL COMPANY
NATIONAL GYPSUM, GOLD BOND
NATIONAL SERVICE INDUSTRIES
NETWORK EQUIPMENT
NEW ENGLAND POWER SERVICE
NEW HAMPSHIRE D.P. CENTER
NEW YORK STATE OFFICE COURT AD.
NEWMONT SERVICES LTD.
NOAA
NORTH TEXAS STATE UNIVERSITY
NORTHERN ARIZONA UNIVERSITY
NORTHWEST MISSOURI STATE UNIVERSITY
NORTHWEST ORIENT AIRLINES
NORTHWEST PIPELINE
NORTHWESTERN UNIVERSITY
NYS OFFICE OF MENTAL HEALTH

INPUT

APPENDIX C

RESPONDENT USERS

OAKLAND PUBLIC SCHOOLS
OHIO MEDICAL PRODUCTS
OKLAHOMA EMPLOYMENT COMMISSION
OKLAHOMA GAS & ELECTRIC
OPTICOM
ORANGE COUNTY
ORANGEBURG-CALHOUN TECH COLLEGE
OREGON STATE UNIVERSITY COMPUTER CENTER
PABST BREWING CO.
PACIFIC SOUTHWEST AIRLINES
PACIFIC TELEPHONE
PARISIAN
PATTEN INDUSTRIES
PENN STATE UNIVERSITY
PENSACOLA JUNIOR COLLEGE
PEPSI-COLA BOTTLING CO.
PETERSON HOWELL HEATHER
PETROLEUM DATA
PHILADELPHIA ELECTRIC
PHILLIP MORRIS INC.
PLANNING RESEARCH CORPORATION
PORTLAND GENERAL ELECTRIC
PORTLAND PUBLIC SCHOOLS
PRODUCERS COTTON OIL COMPANY
PRODUCTS RESEARCH & CHEMICAL
PUBLIC SERVICE OF INDIANA
PYKE MANUFACTURING CO.
RAND MCNALLY & COMPANY
RAYCHEM
RE/SPEC
REILLY TAR AND CHEMICAL CORP.

APPENDIX C

RESPONDENT USERS

REMOTE COMPUTING
REPUBLIC SUPPLY CO.
REPUBLICAN NATIONAL COMMITTEE
RICH PRODUCTS CORPORATION
ROLL COATER INC.
ROUGE STEEL MANUFACTURING
RUBBERMAID INC.
RUMZHEIMERT CO.
SAN ANTONIO PUBLIC SVC BOARD
SAN DIEGO STATE
SAN FRANCISCO STATE UNIVERSITY
SAN JOSE STATE UNIVERSITY
SANDIA LABS
SEARS ROEBUCK & CO.
SERVICE MERCH. DIST.
SOUTH DATA SERVICES
SOUTH WESTERN BELL
STANDARD TEXTILE COMPANY
STATE CENTER COMM. COLLEGE DIS.
STATE OF CALIF. DEPT. WATER RES.
STERLING-WINTHROP RESEARCH INS.
T.V. GUIDE
TEXACO INC.
TEXAS EASTERN TRANSMISSION
TEXAS GAS TRANSMISSION
TEXAS INDUSTRIES
THOMAS NELSON INC.
TIMESHARING CONSULTANTS
TRACOR INC.
TROY STATE UNIVERSITY
U.S. COURTS

APPENDIX C

RESPONDENT USERS

U.S. SOCIAL SECURITY ADMIN.
UCLA HOSPITAL
UNION SCIENCE & TECHNOLOGY
UNION TEXAS PETROLEUM
UNITED AIRLINES
UNITED INFORMATION SERVICES
UNITED TELEPHONE OF OHIO
UNIVERSITY OF ALABAMA
UNIVERSITY OF ARIZONA
UNIVERSITY OF ARIZONA MEDICAL
UNIVERSITY OF ARKANSAS
UNIVERSITY OF CALIFORNIA
UNIVERSITY OF COLORADO
UNIVERSITY OF DAYTON
UNIVERSITY OF LOWELL
UNIVERSITY OF LOWELL COMPUTER CENTER
UNIVERSITY OF MASSACHUSETTS
UNIVERSITY OF MINNESOTA
UNIVERSITY OF NEW HAVEN
UNIVERSITY OF SAN FRANCISCO
UNIVERSITY OF TULSA
UNIVERSITY OF WASHINGTON
VEEDER-ROOT COMPANY
VETERANS ADMINISTRATION REG. DATA CENTER
WEBER COUNTY GOVERNMENT
WELEX
WEST GEORGIA COLLEGE
WESTINGHOUSE ELECTRIC CORP.
WHITE STORES, INC.
WILLIAMS COMPANY
WORCESTER POLYTECHNIC

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RESPONDENT USERS

WR GRACE & CO.
YALE UNIVERSITY
ZIEGLER INC.

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